National Library of Canada
Canadian Theses Service
Ottawa, Canada
K1A 0N4

Bibliothèque nationale du Canada
Services des thèses canadiennes

## CANADIAN THESES

## THÈSES CANADIENNES

### NOTICE

The quality of this microfiche is heavily dependent upon the quality of the original thesis submitted for microfilming. Every effort has been made to ensure the highest quality of reproduction possible.

If pages are missing, contact the university which granted the degree.

Some pages may have indistinct print especially if the original pages were typed with a poor typewriter ribbon or if the university sent us an inferior photocopy.

Previously copyrighted materials (journal articles, published tests, etc.) are not filmed.

Reproduction in full or in part of this film is governed by the Canadian Copyright Act, R.S.C. 1970, c. C-30. Please read the authorization forms which accompany this thesis.

### AVIS

La qualité de cette microfiche dépend grandement de la qualité de la thèse soumise au microfilmage. Nous avons tout fait pour assurer une qualité supérieure de reproduction.

S'il manque des pages, veuillez communiquer avec l'université qui a conféré le grade.

La qualité d'impression de certaines pages peut laisser à désirer, surtout si les pages originales ont été dactylographiées à l'aide d'un ruban usé ou si l'université nous a fait parvenir une photocopie de qualité inférieure.

Les documents qui font déjà l'objet d'un droit d'auteur (articles de revue, examens publiés, etc.) ne sont pas microfilmés.

La reproduction, même partielle, de ce microfilm est soumise à la Loi canadienne sur le droit d'auteur, SRC 1970, c. C-30. Veuillez prendre connaissance des formules d'autorisation qui accompagnent cette thèse.

THIS DISSERTATION
HAS BEEN MICROFILMED
EXACTLY AS RECEIVED

LA THÈSE A ÉTÉ
MICROFILMÉE TELLE QUE
NOUS L'AVONS REÇUE

NL 339 (r. 86/01)

Canada

0-315-24803-3

National Library of Canada
Canadian Theses Division
Ottawa, Canada
K1A 0N4

Bibliothèque nationale du Canada
Division des thèses canadiennes

# PERMISSION TO MICROFILM — AUTORISATION DE MICROFILMER

• Please print or type — Écrire en lettres moulées ou dactylographier

Full Name of Author — Nom complet de l'auteur

DANA LOUISE HAYDEN

| Date of Birth — Date de naissance | Country of Birth — Lieu de naissance |
|---|---|
| APRIL 7, 1959 | CANADA |

Permanent Address — Résidence fixe

95 PALISWAY DR S.W
CALGARY, ALBERTA
T2V 3V5

Title of Thesis — Titre de la thèse

AN ECONOMIC ANALYSIS OF THE PRIVATE USE OF PUBLIC GRAZING LAND IN ALBERTA

University — Université

UNIVERSITY OF ALBERTA

Degree for which thesis was presented — Grade pour lequel cette thèse fut présentée

M. Sc.

| Year this degree conferred — Année d'obtention de ce grade | Name of Supervisor — Nom du directeur de thèse |
|---|---|
| 1984 | DR W. E. PHILLIPS. |

Permission is hereby granted to the NATIONAL LIBRARY OF CANADA to microfilm this thesis and to lend or sell copies of the film.

The author reserves other publication rights, and neither the thesis nor extensive extracts from it may be printed or otherwise reproduced without the author's written permission.

L'autorisation est, par la présente, accordée à la BIBLIOTHÈQUE NATIONALE DU CANADA de microfilmer cette thèse et de prêter ou de vendre des exemplaires du film.

L'auteur se réserve les autres droits de publication; ni la thèse ni de longs extraits de celle-ci ne doivent être imprimés ou autrement reproduits sans l'autorisation écrite de l'auteur.

| Date | Signature |
|---|---|
| October 3, 1984 | Dana Hayden |

NL-91 (4/77)

THE UNIVERSITY OF ALBERTA

# AN ECONOMIC ANALYSIS OF THE PRIVATE USE OF PUBLIC GRAZING LAND IN ALBERTA

by

(C) DANA L. HAYDEN

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

OF MASTER OF SCIENCE

IN

AGRICULTURAL ECONOMICS

DEPARTMENT OF RURAL ECONOMY

EDMONTON, ALBERTA

FALL, 1984

THE UNIVERSITY OF ALBERTA

**RELEASE FORM**

NAME OF AUTHOR DANA L. HAYDEN

TITLE OF THESIS AN ECONOMIC ANALYSIS OF THE PRIVATE USE OF PUBLIC GRAZING LAND IN ALBERTA

DEGREE FOR WHICH THESIS WAS PRESENTED MASTER OF SCIENCE

YEAR THIS DEGREE GRANTED FALL, 1984

Permission is hereby granted to THE UNIVERSITY OF ALBERTA LIBRARY to reproduce single copies of this thesis and to lend or sell such copies for private, scholarly or scientific research purposes only.

The author reserves other publication rights, and neither the thesis nor extensive extracts from it may be printed or otherwise reproduced without the author's written permission.

(SIGNED) Dana L. Hayden

PERMANENT ADDRESS:

95 Talaway Dr. S.W.
Calgary Alberta
T2V 3V5

DATED October 1 19 84

THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled An Economic Analysis of the Private Use of Public Grazing Land in Alberta submitted by Dana L. Hayden in partial fulfilment of the requirements for the degree of Master of Science in Agricultural Economics.

William E. Phillips

Supervisor

Date October 2, 1984

## Dedication

This thesis is dedicated with love to my Grandmother, Mrs. N. Prilusky.

## Abstract

The use of crown owned grazing lands in private cattle operations in Alberta has been ongoing since the late 1800's. The distribution and management of these lands through government agencies has distorted their value both to cattle operators and to other potential users of them, since the actions of supply and demand are not permitted to function freely. Until their value is known, policy with respect to pricing of the resource, and policy to efficiently allocate these lands is elusive. This study looks at one aspect of this problem by attempting to determine the value of public grazing lands to cattle ranch operators.

A simulation approach is employed to trace the impact of varying quantities of publicly owned lease grazing lands on net farm incomes, capital accumulation, and equity. Costs of utilizing public grazing lands are also expressed on a per cattle head basis. The objectives of the study are:

1. To define several representative livestock production enterprises within the Province of Alberta (profiles are specified in terms of economic and physical dimensions);
2. To simulate several combinations of lease vs. owned grazing land upon the representative enterprises to determine the economic sensitivity of each kind of operation to differing land tenure combinations;
3. To determine from the simulations the actual costs of getting calves to market under these various enterprise cases.

Eighteen representative livestock operations are defined and modeled on the basis of information from personal interviews with fifty Alberta cattle operators province wide. Inventories of cattle, land , machinery, and management practices provided a base of information about each operation. Further data are collected from secondary sources, and base data present in the simulation model are used to supplant any deficiencies in information. Nine operations utilizing crown lease land, and nine utilizing no crown lease land are modeled.

The evaluation of the effect of varying quantities of lease land is achieved through use of a beef-forage-grain simulation model developed for Agriculture Canada. For each

simulation, the farm/ranch business is evalutated in the 5th year of a 10 year simulation.

Four quantities of crown lease land are simulated on each operation holding lease land. The original case (full lease) is used as a base from which the lease land component of that operation is removed. Thus four lease simulations for each of the nine operations with crown lease land holdings are created: full lease, 2/3 lease, 1/3 lease, and full lease removed. Nine operations having no crown lease holdings are also modeled to compare the benefits and costs of operating with deeded land exclusively.

The sensitivity of operations to reduction in the lease land portion of total pastureland is determined through examination of net income, capital accumulation and equity levels. The actual cost of getting a calf to market under different lease simulations is determined through examination of cattle expenses expressed on a per head basis.

Results of the simulations indicate that the use of lease land in the majority of cases promotes greater net incomes, increased current assets, and larger additions to equity when compared with operations utilizing only deeded pastureland, or when compared with operations using a lesser proportion of lease pastureland. Increases in net incomes through use of lease land on average are 55 percent for northern operations, 24 percent for central operations, and 18 percent for southern operations. When the size of operations utilizing lease land is considered these averages change to a 32 percent increase in income for large operations, 64 percent increase for midsize operations, and 34 percent increase for small operations. Percent equity changes show declines in all but one representative operation when lease land is reduced, with an overall average percent decline in equity of 1.05 percent when lease land is removed.

Costs per head of cattle do not reveal the same clear advantage. In some cases the use of lease land results in decreased costs per head, and in some cases the use of lease land raises costs per head. These results are qualified through comparison of net incomes from the cattle operation itself, when lease land is used and when it is not. This comparison shows that in the vast majority of cases, net income from the cattle operation is greater when lease land is used.

Through these results the value of lease land to cattle operators is determined. Future policy adjustments in lease land pricing and/or allocation of lease lands to cattle operations or alternative uses may take into consideration the values identified.

**Acknowledgement**

The preparation of this document was made possible through the assistance of many individuals. Mention of them all is impossible, however a number are especially notable.

Funding for this project was jointly undertaken by the Alberta Agricultural Research Trust Fund and the Alberta Cattle Commission. Gratitude is extended to these agencies for their interest and financial support.

Special thanks is extended to my advisors, Drs. W.E. Phillips, L. Bauer, and M.L. Lerohl for their guidance and advice. Dr. Klein of the University of Lethbridge was also helpful in providing the simulation model and assistance in its implementation. Dr. Hudson offered helpful suggestions for the completion of this thesis as a member of my thesis committee.

The staff and students of the Department of Rural Economy were continually helpful and supportive. The duration of this degree was made especially enjoyable due to the friendship extended to me by the members of the 525 Club.

Finally thanks is extended to my family and friends for their encouragement and support. A very special thanks is extended to Mr. Woodrow Hackett for the provision of a continual backboard upon which I was able to bounce ideas and frustrations, and for his enthusiastic support of my aspirations.

## Table of Contents


| Chapter | | Page |
|---|---|---|
| I. | Introduction | 1 |
| | A. Introduction to the Study | 1 |
| | B. Background | 7 |
| | C. Objectives of the Study | 12 |
| II. | Conceptual Framework | 15 |
| | A. The Indeterminate Situation | 15 |
| | B. The Problematic Situation | 16 |
| | C. Economic Efficiency and Equity | 19 |
| | D. Dimensions of the Problem | 21 |
| | E. The Nature of the Problem | 29 |
| | F. Problem Definition | 30 |
| | G. The Factual Situation | 32 |
| III. | Data Collection and Utilization | 33 |
| | A. Data Collection | 33 |
| | B. Summary of Survey Results | 37 |
| IV. | Data Utilization | 43 |
| | A. Inventories | 44 |
| | B. Costs of Inputs and Prices of Outputs | 48 |
| | C. Production Systems | 49 |
| | D. Transformation Rates | 51 |
| V. | Research Methods | 52 |
| | A. The Process of Simulation | 52 |
| | B. The Simulation Model | 53 |
| | C. Simulation of Varying Quantities of Lease Land | 61 |
| VI. | Results | 63 |

A. Method of Evaluation of Results ..... 63
Assets ..... 64
Liabilities ..... 64
Equity ..... 65
Net Income ..... 66
B. Capital Structure Analysis ..... 67
C. Net Farm Income Analysis ..... 88
Northern Operations ..... 88
Central Operations ..... 100
Southern Operations ..... 102
D. Costs per Head ..... 105
Net Income from the Cattle Enterprise ..... 108
E. Range Improvement Costs ..... 112
F. Assignment Fees ..... 114
VII. Summary and Conclusions ..... 125
A. Summary and Conclusions ..... 125
B. Implications ..... 128
VIII. Bibliography ..... 130
IX. Appendix A ..... 137

## List of Tables


| Table | | Page |
|---|---|---|
| I.1 | Amount of Crown Land in Grazing Use in Alberta in 1983 | 4 |
| I.2 | Posting of Agricultural Lands for Grazing Purposes 1982/1983 | 6 |
| I.3 | Grazing Lease Assignment Fees - 1984-1985 | 9 |
| III.1 | Survey Design | 38 |
| III.2 | Inventories of Sample Ranches | 40 |
| VI.1 | Farm Business Summary for Northern Large Operations | 68 |
| VI.2 | Farm Business Summary for Northern Midsize Operations | 70 |
| VI.3 | Farm Business Summary For Northern Small Operations | 72 |
| VI.4 | Farm Business Summary for Central Large Operations | 75 |
| VI.5 | Farm Business Summary for Central Midsize Operations | 77 |
| VI.6 | Farm Business Summary for Central Small Operations | 79 |
| VI.7 | Farm Business Summary for Southern Large Operations | 82 |
| VI.8 | Farm Business Summary for Southern Midsize Operations | 84 |
| VI.9 | Farm Business Summary for Southern Small Operations | 86 |
| VI.10 | Net Income Summary for Northern Large Operations | 89 |
| VI.11 | Net Income Summary for Northern Midsize Operations | 90 |
| VI.12 | Net Income Summary for Northern Small Operations | 91 |
| VI.13 | Net Income Summary for Central Large Operations | 92 |
| VI.14 | Net Income Summary for Central Midsize Operations | 93 |
| VI.15 | Net Income Summary for Central Small Operations | 94 |
| VI.16 | Net Income Summary for Southern Large Operations | 95 |
| VI.17 | Net Income Summary for Southern Midsize Operations | 96 |
| VI.18 | Net Income Summary for Southern Small Operations | 97 |
| VI.19 | Net Income Analysis - Northern Region | 99 |
| VI.20 | Net Income Analysis - Central Region | 101 |

| Table | | Page |
|---|---|---|
| VI.21 | Net Income Analysis - Southern Region | 103 |
| VI.22 | Cattle Expenses per Head Sold | 107 |
| VI.23 | Net Income From Cattle Operations for Northern Operations | 109 |
| VI.24 | Net Income From Cattle Operations for Central Operations | 110 |
| VI.25 | Net Income from Cattle Operations for Southern Operations | 111 |
| VI.26 | Range Improvement Costs per Acre | 113 |
| VI.27 | Business Summary with Range Improvement Costs for Central Midsize Operations - Low Cost Scenario | 115 |
| VI.28 | Business Summary With Range Improvement Costs for Central Midsize Operations - Mid-Cost Scenario | 117 |
| VI.29 | Business Summary with Range Improvement Costs for Central Midsize Operations - High-Cost Scenario | 119 |
| VI.30 | Farm Business Summary for Northern Large Operation - Effects of Assignment Fee | 122 |
| VI.31 | Farm Business Summary for Central Large Operations - Effects of Assignment Fee | 123 |

## List of Figures


| Figure | | Page |
|---|---|---|
| III.1 | Alberta Cattle Commission Zones | 35 |
| IV.1 | Public Lands Divison Grazing Zones of Alberta | 45 |
| IV.2 | Matrix of Representative Cattle Operations | 46 |
| V.1 | Production Alternatives For The Beef Enterprise | 55 |
| V.2 | Production Alternatives For Feeder Cattle | 56 |
| V.3 | Production Alternatives For The Forage Enterprise | 57 |
| V.4 | Production Alternatives For The Crop Enterprise | 58 |

# 1. Introduction

## A. Introduction to the Study

Agricultural land ownership patterns vary considerably among livestock production enterprises. While some livestock producers may be self sufficient, utilizing lands already in their possession, other cattle enterprises may rely heavily on available public grazing lands for maintenance of herds.

Two avenues open to cattle producers wishing to utilize grazing lands other than those deeded to them are private rental or lease from the crown. Private rental tends to vary in cost with land quality, market conditions for land and products, availability of grazing land, demand for land, etc.. In many cases arrangements for rental can only be made on a year to year basis, and negotiations between individuals may break down because of unreasonable or unrealized expectations on the part of landlord, tenant, or both.

Crown lease lands tend to be fairly fixed in quantity, with small increases in total provincial acreages annually. Community pasture and grazing programs administered by the provincial government have received large increases in acreages of late. Crown lands may be leased annually, or up to 10 year terms depending on the type of crown land in question.[1] The importance of publicly owned lands in providing supplemental forage for privately owned ranches in Alberta has long been recognized.

The management, utilization, and allocation of crown lands for livestock production in Alberta have serious impact on the cattle sector. These activities thus influence critically important economic policy issues, and as such should be based on accurate and complete information. There exists, however, a lack of information about the costs of these lands in any given type of livestock operation. Specifically, there is a lack of information regarding the economic value of these lands to livestock producers. Land, as one input into livestock production, must be evaluated by the producer in terms of its contribution to output, and its

---

[1]The different types of crown land available are discussed below.

relative portion of total costs of production. The problem to which this study addresses itself might then be stated as a lack of information or fact.

At present little is known about the economic consequences of various land ownership - land leasing combinations in livestock production. Increasing interest in ownership vs. leasing in Alberta agriculture has brought to the surface a need to examine the economic benefits and costs associated with shifts toward ownership or leasing of land, and specifically as it relates to livestock production. There exists conflict among competing users for the right to utilize a finite amount of crown grazing land. This conflict exists among livestock producers, in terms of competition for the best, least cost land, as well as between livestock producers and alternative users of the land, such as recreationists, wildlife, and timber users. Clear evidence of the tradeoffs involved among uses is lacking.

A number of questions arise from this conflicting situation. What can one afford to pay for lease land? What is the value of public lease land if privatized? How important are leased lands to the livestock operation? What are the costs associated with utilizing lease land? The fact that these questions are unanswered indicates that an indeterminate situation exists in the allocation and use of lease lands in the Province.

The indeterminate situation described can be attributed to the fact that crown lease lands are public in nature, while livestock production is a private activity. Private rental lands are priced according to market signals, such as land prices, output prices, costs of inputs, demand for and supply of land, etc.. Lease land, however, does not enjoy this information exchange. The economic signals between the users of grazing lands and the institutions managing them are unclear. It is also unclear whether equitable and/or efficient allocation of this public resource is being carried out. Thus the problem addressed in this study is the lack of information or fact which would enable the determination of equitable and/or efficient allocation of the lease grazing land resource.

This study analyzes the economic impact of various lease-land, owned-land combinations in several regions of the province of Alberta in order to determine the relative

costs of production associated with ownership vs. leasing patterns under various cattle production arrangements. The costs of production on private rental are usually fairly easy to determine using input costs and output returns. The use of crown lands represents an initial user fee, and in addition further costs incurred by the lessee such as taxes, fencing costs etc., which may or may not occur on private rental land. This analysis involves the determination of these costs on several representative cattle production enterprises within the province.

Much of the grazing land in Alberta is public land. In 1983, there were approximately 2.89 million hectares (7.10 million acres) under lease not leading to title. Of this amount, 80 per cent or 2.30 million hectares (5.70 million acres) constituted grazing leases and permits. Of this total, 85 grazing associations and cooperatives held over 405,000 hectares (1,000,000 acres). In addition there were in excess of 0.28 million hectares (0.70 million acres) in grazing reserves. Table I.1 shows the amount of crown land in use for grazing purposes in 1983 by type of lease.

The evolution of public grazing lands in the Province was initiated in 1872 under the Dominion Lands Act, and geographically followed the settlement of agricultural lands. Specific lease regulations were established in 1881 by the passing of an Order in Council, after grazing leases were established in 1872. Annual grazing permits were established in 1908. [2] Community pastures *per se* had their start in 1930. Currently, use of public land for grazing purposes is either on a group or individual basis. Grazing lease and permits differ mainly in length of tenure, and time and assessment of payment. Community pastures, that is those used on a group basis, include reserves and associations. Associations and reserves differ in that grazing associations are managed by members of the association, and reserves are managed by the government. Initially the grazing program was developed to help the small producer to diversify, stabilize his income, and increase efficiency in the industry.[3] [4]

The first public grazing areas were established in the southern part of the Province, due to limited demand in the northern regions.[5] Demand for grazing reserves in the forest and

---

[2]Wood, p.11
[3]Toma, p.3
[4]Wood, p.14
[5]Wood, p.14

TABLE 1.1: AMOUNT OF CROWN LAND IN GRAZING USE IN ALBERTA IN 1983

| Type of Lease Land | Number of Leases | Hectares | Acres |
|---|---|---|---|
| Forest Grazing Permits | 60 | 21,544 | 53,261 |
| Grazing Leases | 5,457 | 2,162,807 | 5,344,295 |
| Grazing Permits | 897 | 116,354 | 287,510 |
| Provincial Grazing Reserves | 32 | 285,278 | 704,422 |

Adapted from Alberta Energy and Natural Resources Annual Report, March 31st, 1983.

northern areas didn't become prominent until the early 1960's. In 1961, the first grazing reserve to operate in the Peace River Area was established.[6] As settlement moved northward, and the demand for public lease land grew in those areas, further grazing leases were established.

Alberta is the largest producer of beef cattle in Canada, (38% of beef production), and a net exporter of beef. In order to maintain this position, cattle ranchers must maintain their land base. Although there is some increment in the number of acres of farm land in the Peace River region of Alberta, this land is less productive than that in other areas of the province. Pasture acreages dwindle as pressures for land are exerted through urban purchases, more recreational areas, wildlife habitat, highways, and other alternative uses.[7]

Several authors (Sorboe,Weins) have suggested that in order to deal with increasing demands, available acreage (through private or public development) must be increased, or the carrying capacity of current acreage must be improved. Development of private land usually is a profit motivated practice.[8] Since marginal public land (i.e. that land used for public grazing areas) does not follow the same pattern of change, the quantity of public grazing land supplied is relatively constant, with minor increases over time. The Peace River region has received the largest increases of late, however demands for public grazing land prevail primarily in the central and southern regions of the Province (See Table I.2). With demand for public grazing land growing at a faster rate than the quantity supplied, the value of this land in terms of its forage resource is expected to increase. The question may be asked, by how much?

Rental rates on public grazing lands in Alberta have traditionally been quite low relative to the average values of comparable private land, and it is believed in general that livestock producers do benefit from the availability of grazing reserves.[9] By utilizing public grazing lands, operators are able to augment the profitability of their cattle production enterprises. Public grazing lands can support an operator's cattle during the summer months, enabling him to grow feed on his deeded or rented lands to carry his herd over the winter months. Without the use of

---

[6]Wood, p.15
[7]Toma, p.4
[8]J. Weins and M. Sorboe
[9]Wood, p.16

Table 1.2: POSTING OF AGRICULTURAL LANDS FOR GRAZING PURPOSES

1982/83

| Region | Number* | Hectares | Acres |
|---|---|---|---|
| Peace River | 328 | 14,164 | 35,000 |
| North East | 367 | 20,058 | 49,563 |
| Eastern Slopes | 254 | 15,406 | 38,068 |
| Central | 15 | 819 | 2,023 |
| Total | 972 | 50,850 | 125,649 |

* Number of quarter sections or parts thereof

Source: Public Lands Division, Alberta Energy and Natural Resources Annual Report, March 31st, 1983.

crown grazing lands, an operator would have to graze his cattle on deeded or rented lands, thus his ability to grow feed would be reduced. If an operator has access to relatively inexpensive lease land, the costs of feeding his cattle can be greatly reduced. However, as has been stated, there has been a marked increase in the demand for grazing lands, and although the number of areas available for grazing has been increasing as well, though not at an equally fast rate, it is doubtful that there is an equitable distribution of this resource, and there are also many reasons to believe that the existing pricing system is not allocating these resources most efficiently. [10]

**B. Background**

The price paid for the use of these lands is felt by some to be too low,[11] in that annual fee values do not compare well with private land rental fees, and that fair renumeration is not being accorded the citizens of Alberta. Many users of crown lease land feel this is an unfair assessment of the situation because costs other than annual fees paid by users of the resource are generally not recognized. Apart from the annual lease fees paid for these lands, there are many additional costs which an operator must incur before he can actually utilize the land (for example, an operator must fence his lease lands if they are not already fenced and must maintain those fences). If an operator is not given title to these lands, how much capital investment to these lands can he justify? Costs incurred by an operator can vary, depending on the quality of land, method of acquisition, and amount of improvement required for use.

Public grazing lands are unavailable except in the northern regions of the province.[12] Lease land is generally acquired in other regions through transfer, or when existing lessees relinquish their lease holdings. In these areas demand for crown grazing lands exceeds supplies, and any new dispositions (i.e. non-transfers) of lease land are awarded only after a competition for them has occurred. Regional committees, whose members reside in the community and/or representatives of government agencies are organized by the Public Lands

---

[10]Wood p.15
[11]Wood p.15
[12]Public Lands Division, 1983. Information on Public Grazing Lands in Alberta.

Division to recommend the best allocation of lease lands. The final decision of allocation is carried out by members of the Public Lands Division. Because some individuals must necessarily be denied use of crown grazing lands due to supply restrictions, conflicts result.

Application fees are required when applying for lease land. This fee is $5.00 per quarter section, or portion thereof, with a maximum of $25.00. Generally $10.00 of this deposit is taken for an application fee for the first 1000 acres, and $2.00 is taken for each additional 1000 acres or portion thereof. The balance of the deposit is applied toward the first year's rental. Assignment fees must then be paid according to the Grazing Lease Regulations of the Public Lands Act. A sample fee schedule is presented in Table 1.3.

Annual rental rates are based on a formula which takes into consideration the annual gain of cattle on pasture, the average price of cattle on the principal livestock market in Alberta, and the grazing capacity of the land. Lessees are also responsible for payment of municipal taxes on lease lands.

If an operator is the first to utilize a parcel of crown grazing land, he is required to fence the land within a stated period of time after receiving his lease (usually three years). If he receives the crown land from the Public Lands Division with fencing existing on it, he is required to maintain that fence. All users of crown land are responsible for maintenance of fences, except in the case of grazing reserves where the crown manages the land and supplies improvements.

In some cases, especially in the drier southern regions of the province, a lessee will have to carry out some water development (usually dugouts or dams) on the crown lands before he is able to utilize them.

Many operators are fortunate in being awarded leases adjacent to their deeded property. Others may incur costs of transporting cattle by road or expend labour to 'cattle-drive' them over land to their leases.

The costs of range improvement (clearing, breaking and seeding native pasture to tame pasture) vary in the province, depending upon vegetation conditions, local topography and

## TABLE 1.3: GRAZING LEASE ASSIGNMENT FEES - 1984-1985

| Carrying Capacity (Ac./Head) | South East $ per acre | South West $ per acre | Central Alberta $ per acre | Northern Alberta $ per acre |
|---|---|---|---|---|
| 12 | 38.01 | 65.91 | 33.71 | 2.79 |
| 16 | 28.51 | 49.43 | 25.28 | 2.09 |
| 20 | 22.81 | 39.55 | 20.23 | 1.67 |
| 24 | 19.01 | 32.96 | 16.86 | 1.40 |
| 28 | 16.29 | 28.25 | 14.45 | 1.20 |
| 32 | 14.25 | 24.72 | 12.64 | 1.05 |
| 36 | 12.67 | 21.97 | 11.24 | .93 |
| 40 | 11.40 | 19.77 | 10.11 | .84 |
| 45 | 10.14 | 17.58 | 8.99 | .74 |
| 50 | 9.12 | 15.82 | 8.09 | .67 |
| 55 | 8.29 | 14.38 | 7.36 | .61 |
| 60 | 7.60 | 13.18 | 6.74 | .56 |
| 65 | 7.02 | 12.17 | 6.22 | .52 |
| 70 | 6.52 | 11.30 | 5.78 | .48 |
| 75 | 6.08 | 10.55 | 5.39 | .45 |
| 80 | 5.70 | 9.89 | 5.06 | .42 |
| 85 | 5.37 | 9.31 | 4.76 | .39 |
| 90 | 5.07 | 8.79 | 4.49 | .37 |
| 95 | 4.80 | 8.33 | 4.26 | .35 |
| 100 | 4.56 | 7.91 | 4.05 | .33 |
| Fee Per Acre | $456.14 c.c. | $790.94 c.c. | $404.53 c.c. | $33.49 c.c. |

Percentage Change Since 1983-1984

S.E. Alberta ..... a decrease in fees of 3.7%
S.W. Alberta ..... an increase in fees of 5.9%
Central Alberta ..... an increase in fees of 1.0%
Northern Alberta ..... a decrease in fees of 3.1%

Assignment fee or assignments involving family members or estates = $50.00.

Adapted from information sheets supplied by the Public Lands Branch of Alberta Energy and Natural Resources.

other physical conditions. The province offers a range improvement program whereby a holder of lease land may apply to make improvements and if accepted, the province will fund 100% of the improvements to a maximum of $20,000.00. Unfortunately, there is generally a waiting period associated with this assistance, and funded improvements to any crown lands will only be authorized by the Public Lands Division where the land will remain under Crown ownership on an indefinite basis and where grazing has been identified as the long term land use. Other activities covered under the range improvement program are construction of cross-fences, water facilities, stock trails, minor drainage projects, control of brush encroachment, etc.. Where development phases of a range improvement project are spread over several years, completion of the project is subject to continued availability of funds in the Alberta Department of Energy and Natural Resource's budget. These restrictions and other requirements for qualification and implementation of projects prompts some operators to take on the entire expense themselves. Further, where the grazing capacity of the lease is increased, lessees are required to pay increased rental rates in accordance with the increased grazing capacity. All improvements to lease lands, whether funded by the Crown or not, must be approved by Alberta Energy and Natural Resources.

In some areas of the province brush control is a major problem, and lessees are in many instances unable to clear brush due to wildlife habitat priorities, or other concerns. A loss of forage due to brush encroachment results, and generally lease fees are not adjusted accordingly.

Other costs associated with the utilization of crown lease lands that may be significant are costs associated with the alternative uses of the land through disturbance of surface rights. Compensation must be paid to the lessee for any alternate use which diminishes the profitability and viability of his operation. Negative effects may occur on livestock, the operation of machinery, on labour, and noise and loss of aesthetic value may also cause some disturbance. These negotiations are carried out with the lessee and the alternate users. The Public Lands Division has no control over or say in the settlement between these parties.

However, if more than 5 % of a lessee's land is disturbed, the crown will award him additional land to make up the difference, or compensate him accordingly by reducing fees.

Of course, in some cases alternative use compensation may exceed the value of the forage on that land. By ensuring an adequate number of cattle are present on the lease land, so that his lease is not revoked, an operator may benefit from the disturbance through the value of the compensation payments.

Access by alternate users is of great concern to most lessees. Complaints from lessees regarding losses caused by alternate users (primarily recreationists) range from fence cutting and/or fences being left open, to harrassment of cattle, setting of fires, and stealing of cattle. Even though most recreationists are not guilty of these activities, a risk exists with which lessees must deal.

In 1981, continued controversy over the issue of public access to crown grazing leases prompted a review of existing policy in Alberta Energy and Natural Resources. This controversy is in part fostered by a conflict in legislation regarding public access.

The Petty Trespass Act makes it an offence to trespass on any posted Crown land subject to disposition, except a grazing lease or a grazing permit. Conversely, Section 41 of the Criminal Code of Canada provides that a person in peaceable possession of real property can require a trespasser to vacate the property. The Attorney General's Department of Alberta has stated that in their opinion a grazing lessee is a person in peaceable possession of real property.[13] As of 1984, no legislative modifications have resulted from this review. What has been stated by the Deputy Minister, however, is a policy intent with regard to public lands. He has stated that there will be no change in government policy "that would impede the public's access to grazing lease lands."[14]

The argument presented by lessees is that after paying lease fees, assignment fees, taxes, and making improvements, some right to exclude others should be awarded them, to avoid damage to forage, livestock, or improvements on grazing lease lands. This indefiniteness

---

[13]F.W. McDougall, Deputy Minister Renewable Resources, memo May 21st, 1981.
[14]Ibid.

of property rights causes considerable confusion and conflict.

Further problems arise when competing uses are taken into consideration. Since crown grazing land is public land, controversy exists as to whether grazing is in fact the most desirable or efficient use of this land base. Pressures for competing uses arise primarily for recreation and wildlife habitat. Although many grazing land areas would be unsuitable for recreation, and in many cases wildlife habitat as well, some areas are very well suited to many uses. To which use are these lands best allocated?

**C. Objectives of the Study**

Before differences in land value can be assessed, an essential question to be asked is "What is the present value of grazing lands?" The purpose of this study is to clarify the indeterminate situation which gives rise to this question. Sound public decisions with regard to our public lands must be based upon the economic value of these lands to the users, if economic efficiency of land use is to be reflected in these decisions.

In consideration of equity, the distribution, allocation, and length of tenure associated with lease arrangements must be considered. Originally these lands were provided to assist smaller producers to diversify, stabilize their incomes, and increase efficiency in the cattle industry. Whether or not these goals are being met, or whether they are in fact still desirable policy goals remains unclear.

A number of concerns have been raised with respect to grazing lands.

1. There are many individuals who do not have ready access to grazing lands, while others have relatively large amounts of lease land at their disposal.
2. Grazing lands have tended to remain in the possession of certain owners due to tenure arrangements. Crown grazing land is then only attainable from these individuals through purchase of their entire land base. The value of the grazing land is thus capitalized into the value of the individual enterprise.
3. There is evidence to suggest that public lease rates are far below private value for

comparable lands, and therefore some livestock operators are being subsidized, though perhaps not those who may need or deserve it most.

4. This subsidization may be viewed as equitable or inequitable depending on the point of view taken.
5. Increasing pressure for multiple use on public lands has tagged on an additional social cost to the use of these lands for grazing purposes.

Given that these and other concerns have been raised, and that the information required to remedy the problems identified by these concerns is elusive, three main objectives have been established for this study:

1. To define several representative livestock production enterprises within the Province of Alberta. Profiles are specified in terms of economic and physical dimensions;
2. To simulate several combinations of leased vs. owned grazing land upon the representative enterprises to determine the economic sensitivity of each kind of operation to differing land combinations; and
3. From the simulations, to determine the actual cost of getting a calf to market under these various enterprise cases.

In defining several representative enterprises, particular attention is paid to outlining entire operations as accurately as possible. Realizing that in most cases livestock production accounts for one part of an entire farm enterprise, a wholistic picture is presented which approximates the real operation as closely as possible.

Simulating various combinations of lease land and owned land on any given operation enables an estimate of the degree of dependency by operators on leased grazing land to maintain an economic unit. Special emphasis is placed on costs other than annual rental fees that are incurred by operators using crown lease land. Although annual lease fees themselves have remained fairly constant over time, user costs vary with, for example, the extent of fencing, water development, and other improvements that are required for use. In light of these costs, this study attempts to estimate the value to representative operators of the use of lease land

relative to deeded land.

Discussion of the conceptual framework is presented in the next chapter. Chapter III deals with data needs and collection methods. The methods used to analyze the data are presented in Chapter IV. Chapter V outlines the simulation process. Presentation of the results is in Chapter VI, and Chapter VII is reserved for summary and conclusions.

## II. Conceptual Framework

### A. The Indeterminate Situation

Before research or inquiry begins there must be a need for it. A need for inquiry is demonstrated when an indeterminate situation exists, that is, a phase in which problem clarification is lacking and something is amiss. The antecedent condition of inquiry is, according to Dewey,[15] the indeterminate situation. Thus the very nature of the indeterminate situation invokes inquiry to be questionable, uncertain, unsettled, and disturbed. Inquiry is the controlled or directed transformation of an indeterminate situation into a determinate one with constituent distinctions and relations that allow conversion of the elements of the original situation into a unified whole. [16] An indeterminate situation is thus characterized by conflict and confusion. The use of crown grazing lands for cattle production in Alberta demonstrates these characteristics.

Conflict exists in the allocation and use of crown grazing lands. Demand for these lands by cattlemen exceeds the supply of grazing lands at zero price. These lands are thus scarce and competition among cattlemen for them arises. Allocation of public lands is carried out by government institutions which may or may not be doing so in an equitable or efficient manner. Demand for public grazing lands also arises from other sources such as recreationists, timber users, wildlife associations, etc., thus adding to scarcity and competition. Conflict between these groups and cattlemen for the opportunity to utilize crown grazing lands exists in many areas of the Province. The allocation of crown lands to private lease holders is fraught with controversy. How should crown grazing lands be distributed and/or managed to accommodate these competing uses equitably and efficiently?

These problems are relatively straightforwardly resolved in private pasture rental situations. Where demand for pasture exceeds the supply, rental fees increase; where conflicting groups are bidding for the same parcel of pasture, the highest bidder will generally be awarded

---

[15]Dewey, John pp.104-105
[16]Ibid. p.105

the parcel (exceptions occur where 'good-neighbor' transactions influence allocation decisions). Competitive use demands are handled by the owner of the land (the owner of property rights) in such a way that his demands of use are met. Thus conflict is more easily handled in private pasture rental situations. In private use of public grazing resources however, this market mechanism is not working. Allocation is carried out through policy relatively unaffected by market forces.

The management and allocation of crown grazing lands for livestock production in Alberta greatly affect the cattle producing sector. Decisions that affect this land utilization become critically important economic policy issues that should be analyzed and resolved with accurate and complete economic information. Such policy decisions influence the economic efficiency of grazing land allocation and the distribution of benefits and costs from public land use.

The distribution, allocation and management of crown grazing lands is carried out by public institutions. Conversely, the utilization of crown grazing lands is by a private individual or groups. Further, the historical use of these lands greatly influences the social institutions created by these and other private entities in various areas of the Province.

Before policy can be determined for the allocation and use of public grazing lands, their value must be determined. The value of private grazing land is determined through market forces of supply and demand. Crown grazing lands, however are not open to market forces, and thus their value is more difficult to determine. In a situation where a public resource is utilized by private individuals additional confusion exists where equity and efficiency goals compete.

**B. The Problematic Situation**

An indeterminate situation becomes problematic in the process of studying it.[17] In order to study an indeterminate situation, aspects of a determinate nature must be identified to

---

[17]Dewey, John. p.107

provide a starting point for study of the nature of the problem. The root cause of the problem can be stated as:

The value attributable to the utilization of crown grazing lands is unknown.

The conflict and confusion that exists with regard to crown grazing lands in the Province occurs because of existing property rights and institutional arrangements. [18] In order to fully understand the nature of the inherent problem, it is expedient to understand these circumstances.

The first major institution that affects the allocation of benefits and costs from the use of public grazing lands is that of property rights. Property can be taken to refer to a wide range of entitlements to the use or benefit of various assets that enjoy some sort of support or protection.[19] "Property rights are derived from a variety of sources including the customs and traditions of a society, legislations and regulations, and the ruling of courts and other tribunals."[20] Thus property is commonly refered to as a bundle of rights to control. "The individual "strands" of this bundle may be distributed among the organized public (the state), the owners, the users, the creditors, the laborers, and possibly others."[21] Each bundle may have various combinations of rights to own, use, transfer, and exclude others. Because of the enormous number of possible combinations of rights to land, the courts have tended to standardize property rights bundles into freehold tenure, leasehold tenure and easements. All standard bundles are, in varying degrees, exclusive, enforceable, divisible, and transferable. Since these property rights are derived from various institutional forces, rights to entitlements may be thought of as expectations. Landholders' rights to property have characteristics that fragment entitlement to any parcel of land with respect to three dimensions, time, space, and multiple use. [22]

---

[18]"Institutions are collective conventions and rules that establish acceptable standards of individual and group behavior." (Bromley, p.839) Organizations are the operationalization of institutions.
[19]Knetsch, p.20
[20]Ibid. p.20
[21]Ciriacy-Wantrup, p.141
[22]Scott, A., p.558

Property rights to land in private and public grazing rental are well defined. The landowner has almost exclusive right to use his land as he sees fit. Property has been called "ownership, the unrestricted and exclusive right to a thing; the right to dispose of a thing in every legal way, to possess it, to use it, and to exclude everyone else from interfering with it."[23] In Alberta there exist various statutes that remove the proprietory rights of an owner. These range from the Historical Preservation Act to the Noxious Weed Act, and to the Expropriation Act of Alberta. Thus in some cases society may limit the exclusiveness of ownership of property. Property rights are not static in nature and are subject to change. As rights change over time, they modify the value of property.

The lessees of lands, however, generally have limited rights to the use of land, the degree of their rights usually specified by the private or public landowner. Lessees of crown grazing lands have been awarded certain rights to land and are restricted from others. Lessees have the ability to transfer their right to utilize public lease lands, and some rights to exclusion (though there exists a great deal of controversy over the degree of right to exclude).

Property rights in public grazing land use are, however, imbalanced and uncertain. They are imbalanced in that all benefits or costs that are produced through the use of these lands may not accrue to the producer, and they are uncertain in that tenure situations do not foster security in use of these lands.

Historical allocation of lands in Western Canada was characterized by an abundance of land available for use and settlement, and rights to that land were easily obtained. "Until the last two decades and the rise of the environmental - conservation movement, use control of the public lands resided largely in the regional commodity users: ranchers, miners, loggers, and irrigators"[24] Now however, demand for amenity services has increased as recreation and environmental interests have developed. Allocations of title to public land over time [25] have decreased the supply of public lands available for use. Yet the concept of free use of public

---

[23]Black, 1968
[24]Gardner, B.D., p.218
[25]For example: homestead land grants, reservations of land for provincial parks etc..

lands has survived in the minds of most Albertans as a strong social institution. As social institutions change and evolve so do the perceptions of the private sector to the appropriateness of public institutions' activities with respect to public property and its use. The concept of free use has, however remained unchanged in the minds of Albertans. In examining present property and social institutions it is important to consider historical allocations, as these influence greatly the *status quo*.

**C. Economic Efficiency and Equity**

In attempting to sort out and solve the problems associated with the private use of public grazing lands it is particularly useful to examine the problems in light of economic theory. Economic theory relevant to the problem at hand considers issues of property rights, market failure, and ties these concepts into externality theory.

Economics is a positive science that attempts to explain the behavior of economic agents in terms of what is. It is also a normative science, which prescribes behavior that is required to attain desirable goals, for example, efficient resource allocation. Resource allocation through economic science must necessarily also be inextricably entwined with politics, as politics is the study of the whole system of coercive or potentially coercive relationships.[26]

If then, economics is concerned with exchange and trade among individuals, more than monetary variables are relevant in choices. "The terms of trade incorporated in a given choice will almost always include a host of nonmonetary factors: freedom, comfort, altruism, fidelity, beauty, etc., which impinge on the exchange transaction."[27]

The two most significant issues treated by economic science are economic efficiency and distributional equity. Economic efficiency implies getting the most output from limited resources, i.e. using the 'best' combination of inputs in their highest valued uses. Thus measurement of the most output in private use of public lands must examine benefits in relation to the costs associated with alternative land use patterns.

---

[26]Buchanan, J.M., p. 34
[27]Gardner, B.D., p.3, undated.

This process of productive activity generates both "goods" and "bads". The "goods" are the consumable products that add to human satisfaction, the "bads" are waste, or results that detract from that satisfaction. Where the "goods" or "bads" are not captured by market prices, they are termed externalities.

If there is to be efficiency in productive activity, then returns to like units of outlay must be equalized at the margins, that is, inputs must be used up to the point that their contribution to output exactly equals the amounts they are paid. In the case of temporal allocation of grazing lands, the goal is sought to allocate these lands through time such that the net worth of the capital stock is maximized at any point in time. For example, if, based on an efficiency criteria, it was determined that the use of a parcel of public land for private grazing use afforded a positive net worth of $100, and the use of that same public land for recreation afforded a net worth of only $25 , then efficient allocation of this public land would lie in grazing use. However, if in 20 years these net worths change, so that the net worth of recreational use exceeds that of grazing use, efficient allocation would then lie in recreational use. One way this net worth is measured is through the concept of opportunity cost. The opportunity cost of producing one commodity is the value of the resources used to produce that commodity in their best alternative use, or production of an alternative commodity. Thus the opportunity cost of using lands in the public sector is their highest valued employment in the private sector.

One question that must be answered in dealing with public grazing land is how best are these lands utilized? Economic theory points to satisfying the criteria of economic efficiency. Equity concerns are also of great importance however.

"Equity in the distribution of income and wealth is the second great issue in economics. What factors determine the distributional shares of economic product captured by various economic agents who contribute to economic output?"[21] Equity examines who benefits from an existing situation , and who bears the cost of maintaining it. Property rights are obviously

---

[21]Gardner, B.D., p.5. undated.

critical in determining these distributional shares. With the problems of imbalance and uncertainty of property rights, the actual economic product captured by economic agents is unclear.

The allocation and use of grazing lands must be based on economic efficiency criteria, while taking into account those aspects of equity which are determinate. In this study economic efficiency will be analyzed from the viewpoint of individual cattle operations. In order to determine this efficiency, the true value of these lands to cattle operators must be made determinate.

The problematic situation may be described as follows:

The actual value of crown grazing lands is unknown, thus its efficient or equitable allocation and management is elusive.

From the problematic situation it is most expedient to proceed to the formulation of the problem. As is pointed out by Northrup, "It is the problem and its characteristics as revealed by analysis which guides one first to the relevant facts and then, once the relevant facts are known, to the relevant hypothesis."[29]

**D. Dimensions of the Problem**

The problem of valuing the public grazing land resource is best observed in light of firm theory. A cattle operation is a firm whose manager attempts to maximize net profits. To attain this goal a manager must consider both input costs and output prices. When units of output (cattle produced and sold) are multiplied by the price of the product (price per cwt. of each kind of livestock) the total value product is obtained (TVP). To determine the additional value of output produced by each additional amount of variable input used (lease land) the change in TVP divided by the change in variable input price must be determined. This value is the marginal value product (MVP). Costs can also be treated in a similar fashion. The marginal factor cost (MFC) is the amount added to total cost when one more unit of the variable input

---

[29]Northrup, p.17

is used. An optimum in production, which will produce the greatest net returns occurs where MVP = MFC. In actual fact, these values may be elusive, and reaching this optimum is rarely feasible, as prices and costs, and even production processes, are constantly changing. It is the task of the manager however to as closely as possible approximate that equilibrium (if profit maximization is a sole goal). In order to do so, the costs of inputs and value of output must be determinate. In this study the actual value of crown grazing land is at question. To determine that value, as many costs as possible must be identified and quantified to aid in determination of the MFC associated with utilization of grazing land. Some of these costs are easily quantified, while others are not. Specifically, those costs related to equity concerns are most difficult to quantify.

Some symptoms of the crown grazing land problems might be anticipated, while others are less obvious, and become apparent only after studying the situation. Some common concerns are presented below.

Probably the most commonly presented concern regarding crown grazing lands is the inability by some ranchers to acquire lease land. The area of land available for public cattle grazing has been continually increasing, but not at a rate equal to the increasing demand for the land resource in many areas of the Province.

Private grazing lands vary in availability throughout the Province. Similarily, fees charged for the use of these lands vary both with market influences, and physical attributes of the lands. Since the interests of lessors of private grazing lands lie in exacting some profit from their lands, fees charged for them are generally competitive, and at a premium.

The Public Lands Act specifies requirements of age and citizenship to be eligible to apply for public grazing lands. In addition, preference is given to individuals already holding land and requiring additional land to make an economical unit. The ownership of base property requirement creates an efficiency- equity conflict. There is no reason to believe that a non-holder of land would be any worse at cattle husbandry than a land holder, or that he deserves the land less. Further, the allocation of these lands is subjective, in that it is carried

out by individuals at various levels of government deciding a 'need' by operators for this land, thus efficiency considerations generally take a side position relative to equity concerns. This is not to say that equity concerns are not important, only that subjective allocation is rarely efficient as well.

A second concern relates to tenure status, which is a direct result of the property rights associated with public grazing lands. In Alberta leases on public grazing lands were initially issued for 20 year periods. In the late-sixties this policy was revised to allow the issue of generally 5 to 10 year leases. This tenure is however awarded with an option for renewal, and leases are generally only cancelled if the land is unused or abused. This tenure arrangement fosters a situation where lease land, for most intents and purposes, becomes 'attatched' to certain operations. Although title is not awarded to the lessee, certain aspects of ownership are certainly simulated. In terms of the distribution of crown lease land, this arrangement ties up land and renders it unavailable for other uses and users. Purchasers of private grazing land are willing to pay a premium to a seller in cases where a public grazing permit is transferred with the private sales transactions. This premium is especially pronounced in areas where public grazing lease is not readily available - which in Alberta is most areas south of the Peace River Region, or where the lease land is an integral part of an existing operation. This practice allows captialization of lease holdings into base property values, and may foster transfers of lease land for speculative purposes.

A public resource held by one individual or group of individuals for an extensive period of time reduces its 'public nature', both in the eyes of the public and the lessee. Social institutions also play a large role in the durability in use of grazing lands, even where tenure is not guaranteed. "Local custom and tradition known and respected by the tenant may make such a tenure definite and secure."[30] Social institutions have distorted the actual rights that a lessee may posess. "Some expectations regarding the use of land, for example, receive strong community support and remain almost invariant over time - - although the specific rights that

---

[30]Ciriacy-Wantrup p.152

receive such sanctions vary widely among societies - - while others are more tentative, and are recognized as being so."[31] Who should be allowed to use this resource and for what period of time? What implications does this have for present and future generations?

Tenure can adversely or beneficially affect the value to a lease holder of lease, depending on his and other's expectations of the security of tenure associated with the piece of land in question (i.e. whether or not that land will remain as grazing lease land).

> It might be of some advantage to view the issue in terms of the change in welfare that would accompany or be associated with the "endowments" or changes in the endowments to individuals. Presumably, there is some level of expectations enjoyed by the individual. The utility of expectations will likely reflect, all other things being equal, their security and a more tenuous one will be discounted relative to one more certain to protection. Any change in circumstances that adversely affected an expectation, even one known to be tenuous, would decrease the well being of the individual.[32]

Unpriced costs that a rancher incurs due to tenure can be identified as costs of uncertainty. A cattle operation is one characterized by long term planning, due to the biological growth cycles of cattle. As such, reversal of management goals is not quickly facilitated. If a rancher is uncertain of lease renewal, he will be hesitant to increase herd size as large as may otherwise be possible with a given amount of lease land in the event that his lease is terminated, and he is faced with the problem of stock liquidation and lost capital investment on the lease land, as he is later unable to retrieve his investment. While the value of improvements is generally awarded a lessee upon termination of his lease, the depreciated value of improvements often does not resemble an operator's estimated value of them. Thus another efficiency-equity dilemma exists.

In range improvement, returns to investment are positive only if the cost of improvements can be retrieved through use. Private investment is efficient if resources utilized in improvement have net economic yield higher that that in their best alternate use, and if the marginal benefits of the use of inputs equals or exceeds their marginal costs.

---

[31]Knetsch, p.20
[32]Knestch, p.27

But investment on public lands is much more complex; where multiple use and multiple products must be evaluated. Increases in forage may be allocated to uses other than livestock grazing, and many of these uses are difficult to quantify. Cost sharing between government and private agents rarely results in an efficient quantity of investment funds, because a lessee has no guarantee that he will be allowed to utilize improvements, especially where multiple use pressures exist. Where improvements raise the carrying capacity of the lease the lessee is charged additionally for the increase. All improvements undertaken on lease land generally remain on the lease land, and become the property of the crown. "It must be quite obvious that lack of a clear title to range improvements and required authorization for removal must impair incentives for improvement investments. Besides, most improvements (fences, water developments, vegetation conversion) are simply not removable."[33]

Further inefficiencies arise because public funding of range improvements are directed toward lower income ranchers by policy [34] rather than toward projects which may yield higher net returns. The continued misallocation of funds to range improvement maintains public lease land as an inferior resource with lower carrying capacities and yields.

The issue of the level of fees charged for forage on grazing lands has received particular attention. Upon comparison with rates charged for private grazing lands to determine a fair market value, [35] one would conclude that these rates are relatively low, and as such demand can be expected to surpass supplies. Eligibility requirements of citizenship, quantity of base land holdings etc. serve to suppress the demand for public grazing lands. Even so, demand continues to be greater than the supply at zero price. In order to allocate the resource, some means of rationing must be implemented.

In the Public Lands Act, allocation conflict is reduced by awarding these privileges to the ranchers who utilized the land originally, and it is usually they who have existing local base

---

[33]Gardner, B.D., p.18, undated.
[34]Public Lands Division, Alberta Energy and Natural Resources. *Range Improvement Programs 1982-1983.*
[35]Fair market value is usually defined to mean what a good would be worth if it were allocated in private and competitive markets.

property. Many of these individuals (or their forefathers) were pioneers who were largely responsible for the area's settlement and development. A policy not equitable to them would have little support. But this policy itself ultimately may have produced a set of regulations resulting in inefficient resource allocation, a classical efficiency-equity tradeoff.

Pressure for raising the fees charged on grazing lands is based on the rationale that public owners of the range resources should receive its fair value to avoid subsidizing specific user groups, who have been subsidized for a long time anyway. Thus equity is served by requiring a tenant to pay full value. The debate may then center on "What is fair value?" With non-priced concerns and equity issues entwined, this is not an easy value to determine.

Part of this controversy must embody whether the permit value should be included as a cost of grazing. Permit values are generated by government policies that priced the grazing land below its value, and gave the ranchers some measure of security of future use. Yet the government maintains that the permit is a privilege and not a right, and therefore has no legitimate value. The grazing fee, as any price, has distinct efficiency as well as equity implications.

Since transfers by lessees of authorization to utilize lease are almost unrestricted, [36] and a capitalized value exists, the level of the fee is innocuous in its allocative impacts. Since allocation is partially restricted through eligibility requirements, the level of the fee simply determines an annual economic rent captured by lessors.

If, however, the government were to raise the fee levels, the permit value would fall, and ranchers would suffer a wealth loss. If a rancher purchased the permit at a higher price, his wealth loss may be great. If he has always held the permit, it may not be so great, but it is still a wealth loss. In terms of equity, does it make sense to shift economic rent to public owners, and impose losses on ranchers, many of whom have incomes below the national average?

---

[36] A lessee must hold authorization to utilize lease land for a minimum of 3 years, and can only transfer that authorization to parties qualifying to hold lease land under the Public Lands Act (i.e. lessees must be 18 years of age and possess Canadian citizenship).

Equity is also an issue relative to multiple use. Some users of forage such as livestock grazers pay fees, other indirect users such as hunters and fishermen pay a licence fee, although the amount paid is hardly a reflection of the average value of the service provided by the public land or water. Still others such as watershed beneficiaries and many types of recreationists pay no fee.

Public land used for open space, for its aesthetic quality, for existence demand or option demand is nonrival so long as congestion does not occur. Pricing of public lands in these cases is infeasible, because exclusion is generally impossible. Yet, it also appears inequitable to exclude the public from the use of public land. Equity problems will always exist where some pay and some do not.

In terms of positive analysis, it is equally important to analyze the impact of the Public Lands Division's grazing fee policy on the distribution of rancher incomes as it is to analyze its impact on the allocative efficiency of forage among ranchers. A major discrepancy arises, however, when economics is used to measure normative aspects. Efficiency is almost tautological, more output of a useful product must be better than less. Equity however, is not a straightforward concept. "It is impossible to prove that one income distribution is "better" than another without making interpersonal comparisons of levels of satisfaction."[37] Similarily, there is no objective way of demonstrating that a more egalitarian distribution is best, though this is often assumed to be the case. What economics can do, however, is determine Pareto efficient allocation. That is, it is possible to determine changes which would make one individual better off, (in terms of net income or some other criteria) without making another worse off.

Despite the problems inherent in evaluating income and wealth distribution, these are issues which must be confronted. If public decisions on the ownership and management of public lands are to be informed and efficient, some important questions must be answered.

What are the outputs that could be produced on public grazing lands and what are they worth? How does a value become established if competitive market prices are unavailable?

---

[37]Gardner, B.D., p.5 undated.

What are the inputs needed to produce these outputs, and what, if any, net benefits are foregone if these inputs are utilized on private rather than public lands? What are the outputs which are nonpriced, and who may best account for these externalities? What outputs may not be produced by the public sector since they are public goods and thus always public in nature (eg. air, visual amenities)? How efficient is the Province of Alberta in providing development and management of the public lands?

In addition to these efficiency questions are equity concerns. Which interests are best served by this resource use? Clearly pressure from special interest groups must influence these decisions, but the many users of public lands have disparate representation, and this factor must be taken into consideration. Policies influenced by pressure groups must not fall into the trap of foregoing a 'reasonable' difference between the cost of inputs and the value of outputs. Who decides, and by what standards, what is a reasonable difference remains a question.

When multiple use is considered, further conflicts arise. The term itself implies that more than one user or class of users have valid claims to land use. How much use, for what time period, or which uses have priority is unspecified by this term, and its ambiguity is apparent in lands policy. Here efficiency is the most important criteria to follow in determining the implementation of multiple use, in order to maximize the benefit cost ratio. Other criteria are also used, but their implementation creates distortions in the meaning of multiple use.

The problems encountered in making allocation policy theoretically acceptable and practically workable are even more numerous and complex when a public accounting stance is taken. The Province has a mandate to consider resources in terms of a public accounting stance, rather than one private in nature, and must satisfy criteria of allocative efficiency in resource use over time. "If there are discrepancies between the revenues and costs considered by individual planning agents and social revenues and costs, there will be differences between the private and social optima in the state of conservation"[31] The objective of government policy must be to reduce these differences by inducing private conservation decisions to approach the

---

[31]Ciriacy-Wantrup, p.237

social optimum more closely. It is doubtful whether any public stance taken with respect to the grazing land resource would ever satisfy private lease users, because the incidence of revenues and costs considered by private agents and the public are necessarily different. Until the land in question is allocated to private concerns, if this occurs at all, a public accounting stance must be taken. In light of the desire of society to bequeath resources (intact) to future generations, conservation is an issue of prime importance. Private economic agents must ultimately accept the public stance taken in terms of allocation of resources.

In order that the use of this resource can be allocated in the most efficient manner, the value of it in each use must be determined. This study will examine the value of grazing lands to cattle operations.

**E. The Nature of the Problem**

The nature of the problem must be identified in order that further analysis of the problem can be carried out along fruitful lines. Northrup has distinguished three types of problems, each requiring different analysis procedures. These are: problems of logical consistency of theory, problems of the empirical truth of theory, and problems of value.[39]

In the problem at hand there is an inadequacy of factual information which precipitates a problem of empirical truth of theory. Factual information that is lacking is the real value of crown grazing lands to cattle producers and to the general public. The value of private grazing lands is determinate, through market transactions. In public grazing land use this interaction is non-existent.

The value of grazing lands to society and to livestock producers may differ considerably. Society has a value based upon demands other than just those of consumption, in existence and option demands. Livestock producers are more likely to consider grazing lands in terms of the economic rent that can be derived from them. Each individual operator may have an intuitive feel for the economic benefits that he may derive from lease land, but rarely would

---

[39]Northrup, p.19-20

this value be amenable to explicit expression. Until this economic benefit is known, a true value of public grazing lands is elusive.

There is also a problem of logical consistency of theory, in that the economic theory applicable to private grazing lands allocation in competitive markets with well defined ownership rights is not applicable to the allocation of public grazing lands.

A third portion of the problem involves questions of value. The utilization of public grazing lands abounds with attitudes and beliefs toward ethical, esthetic, proper use, and equity issues. The public not using the grazing resource have become acutely aware both of the stake that society as a whole has in the shaping of our Province, and of the flexibility of use of public resources that exists. There exist strong values and beliefs on the part of users and potential users of the resource.

Conflicting values pose problems where inquiry or solution is concerned. Normative questions cannot be answered by direct appeal to fact, but as Northrup states "..they can be converted through analysis to questions which are answerable in factual terms."[40]

**F. Problem Definition**

Economic theory explains the means by which a manager of a cattle operation would assess the value of public grazing lands. Society assesses this value differently, but the ultimate value of these lands to either group depends upon the property rights associated with them. The imbalance of property rights in grazing lands has created a situation where the market fails to operate as it would were the 'law of supply and demand' operating. This market failure has fostered an abundance of externalities.

Externalities arise where a cost or benefit is imposed upon a party through the actions of another party . An example of an external cost which occurs on crown grazing land is the damage of a lessee's fences by recreationists. The creation of roads or trails by lessees may provide an external benefit to recreationists. Another example of an external benefit may be the

---

[40]Northrup, p.31-32

revenues earned by the lessee through the expropriation of surface rights for subsurface development (if net revenues are positive). It is actually the institutional structure of property rights which determines which external costs or benefits will be reckoned by whom. The value of these externalities is critical information in the assessment of allocation of public grazing lands.

The fact that it is unknown whether grazing lands are being allocated efficiently would indicate that a policy change may be called for. However, just as in the case of efficient allocation of grazing lands, where their allocation is deemed efficient or not depending on the opportunity cost of utilizing those lands elsewhere, so must the possibility of policy change be evaluated in terms of whether a policy change would create net benefits, or cost more than the extra benefits created by it. Thus the actual value of grazing lands to cattle producers must be determined as a component of these costs and benefits before any policy changes or evaluation of their present allocative efficiency can be carried out.

In this study then, the actual value of crown grazing lands is at question. In order to determine that value to cattle operators, the costs and benefits which accrue a user of lease lands in terms of lease fees, dollar value of forage, etc. must be examined. Other costs and benefits which are a direct result of external effects should also be examined in light of existing property rights, because it is the property rights which determine who gains and who loses, and in turn which policy changes under the existing property rights are most efficient. It is also necessary to examine the costs and benefits of multiple use. The latter two tasks, however, exceed the scope of this study.

The foregoing discussion has presented characteristics and dimensions of the problem at hand. Before any attempts can be made to solve even a small part of it, it must be reduced to manageable proportions and stated in terms amenable to solution. Prevailing economic and social institutions may be inadequate to ensure an efficient allocation of the grazing resource and an equitable distribution of the benefits and costs of grazing land use among competing uses. Before this can be determined, discovery of the value of the resource to cattlemen must be

made.

**G. The Factual Situation**

In order to be guided toward solution of the problem, further knowledge of the root cause of the problem is required. Factual information is required about the utilization of lease lands in the Province, and their biological capabilities, specifically the flow nature of the forage resource. Information is needed about the institutions which allocate, and those which manage public grazing lands. The distribution of grazing lands is also important information. The objectives and activities of the public agencies involved with crown grazing lands must be determined.

Economic theory clarifies the need to be able to identify the MFC and MVP of utilization of lease lands. These values can only be determined if costs and benefits are elucidated. Firm theory provides a means to determine the value of grazing lands to cattle producers. The economic concern of value is with economic efficiency. Information is needed to answer the questions of "What does it cost?" The method of analyzing this information must be factual. The model utilized for this study is able to transform varying quantities and kinds of inputs into outputs, utilizing resources as necessary. Data needs then reduce to quantities and costs of inputs, transformation information, and the value of outputs. Economic and social data are needed about grazing lease land users, and those cattle operators who do not utilize lease land. Other demands for the grazing land base must be elucidated.

Firm theory and resultant analysis provides solution to the cattle operation efficiency problem, and as such is the most logical point at which to start analysis. It is however, only one part of the overall social efficiency-equity problem. Other analysis is needed to determine the most efficient allocation among conflicting demands for public grazing lands. It would be heroic to attempt to carry out this further analysis in a study of this scope. Rather, this study attempts to treat well one portion of the information requirements, that is, the value of lease land to cattle operators.

## III. Data Collection and Utilization

### A. Data Collection

The data requirements for use in the simulation model arise from the need to create several representative farms involved in cattle production. A survey of forty-nine randomly selected cattle operations provided basic information on farm assets, livestock inventory, leasing arrangements, and production costs which are essential in creating the representative farms for simulation. Personal interviews were conducted with each survey respondent, each interview requiring between one and three hours , with an average of one and one half hours. The survey questionnaire is contained in Appendix A.

The choice of interview participants was derived from a mailing list provided by the Alberta Cattle Commission (ACC). The list contains approximately 36,000 names. All members of the list have sold cattle within the last few years, though the number of cattle sold, and the operators' sizes were not indicated on this list.

A sample of fifty farmers or ranchers was deemed sufficient for this study's analysis given constraints on time and funding. The Alberta Cattle Commission has for their own purposes divided the province into nine zones. These zones were adopted for this study, their boundaries approximately dividing the province into similar regions for cattle production. A minimum of three interviews per ACC zone was stipulated to ensure inferences about the population could be made. Figure III.1 shows these regions.

A total of 86 names was required to ensure adequate sampling within each of the nine ACC zones in the Province, and to provide alternate names in the event that individuals chose not to participate in the interview, were unavailable, or when contact by phone was never achieved. The actual number of interviewees in any zone was entirely dependent upon the number of original randomly chosen names for any given area, reflecting population distribution among zones.

The random sample of names was chosen using a randomly cited systematic sampling technique. A computer generated random number between one and 400 was chosen, and the name on the mailing list (alphabetical) corresponding to this number was chosen. Every 400th name after this initial name was then chosen, producing a list of 86 names. These 86 names were later randomly divided into two lists, a primary and a secondary list; the primary list having fifty names and the secondary list having 36 names, with the aid of computer assisted sorting. These names were then plotted on a map of Alberta displaying the nine (ACC) zones chosen for the province, to ensure that at a minimum three people would be represented in each area.

In order to compare operations within any given zone, each interviewee with lease needed to be compared with other operators in his general vicinity not holding lease to give a balanced picture. Postal codes were used as an indication of each operator's location. Although postal codes may provide some inaccuracy in location, in that the postal code usually represents the nearest post office rather than the operator's actual location, a better alternative method was unavailable.

For every name chosen for a potential interview, two additional names with an identical postal code were also chosen. The first identical postal code occurring before and the first after the original name chosen was located on the mailing list, and these two additional individuals were taken as persons whose operations would be compared with the original operator. Of the two additional names chosen with similar postal codes, one was used as a main comparison, and the other as an alternate comparison for the primary 86 operators. A computer was used to randomly generate "1's" and "2's", "1's" representing those individuals with postal codes before the original name, and "2's" representing those with postal codes after the original name. If a "1" came to be associated with a name, that individual was to be used as a main comparison, and a "2" would indicate the alternate. When contacting individuals for interviews, the main comparison was contacted first after the primary interviewee was contacted. If that individual was unavailable for the survey, the alternate individual was

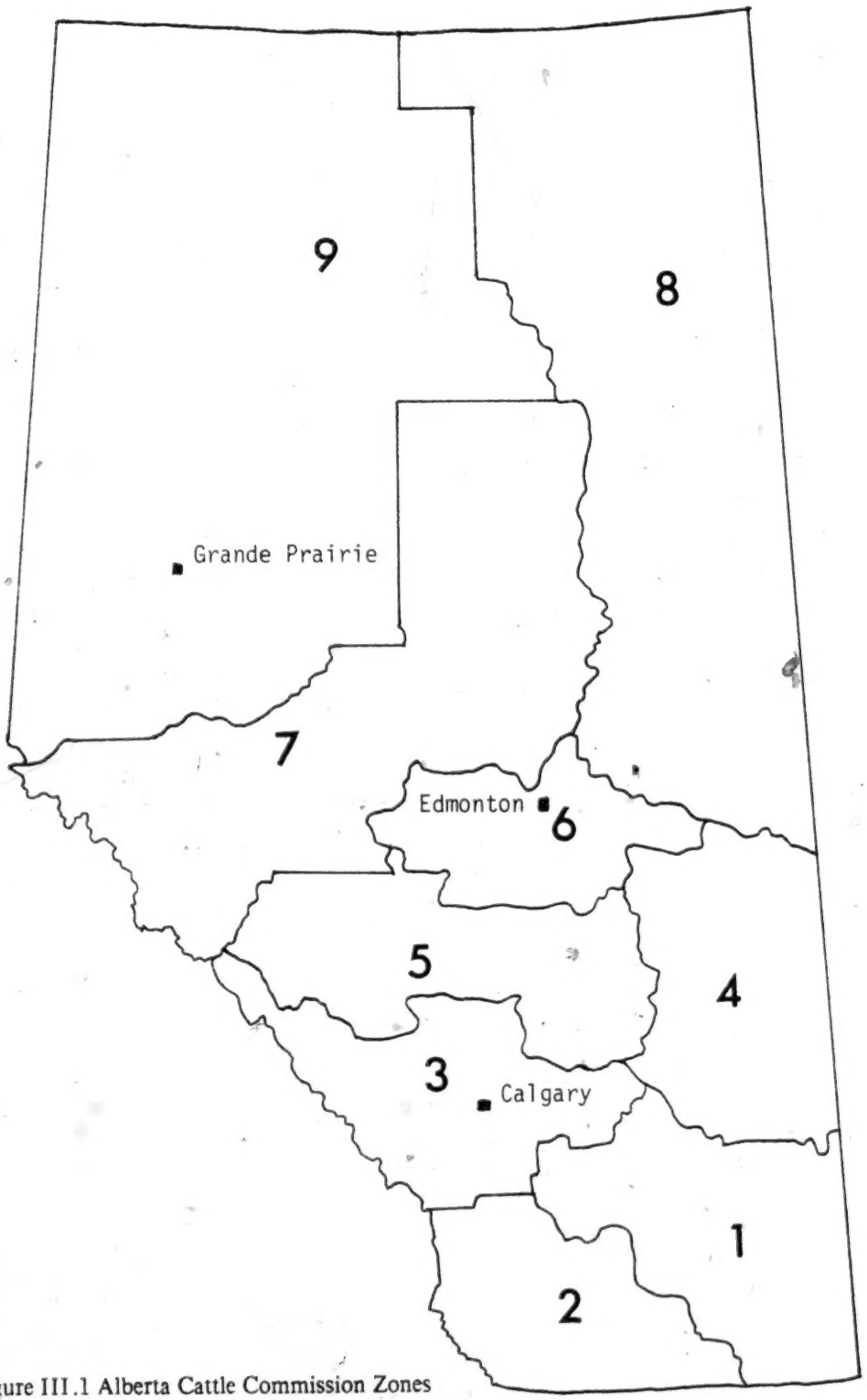



Figure III.1 Alberta Cattle Commission Zones

contacted. The total number of names derived from the mailing list was 258.

Once the list of names was compiled and sorted, phone numbers were determined for each name through the use of regional telephone listings. In some cases (approximately 15) telephone numbers were not obtained because the numbers were unlisted or, presumably, the name on the mailing list was not the one listed with a telephone number for that operation.

Representatives of the Alberta Cattle Commission indicated that ACC zone representatives should inform possible interviewees about the study and the interviewer. The ACC representatives closest to the individuals on the survey list were contacted prior to interviewee contact. The ACC representatives were informed of the study and asked to contact interviewees by way of an introduction for the interviewer. Some ACC representatives were unable to contact interviewees, however many were contacted and apprised of the study. The interviewer then telephoned those individuals on the survey list, whether they had been contacted by ACC representatives or not, to request an interview. Those interviewees who heard from the author without prior notification or knowledge of the study from the ACC representatives were neither more nor less responsive to the study. Once contact had been made with the interviewees, appointments were arranged, and the interviewer travelled to the operator's home to conduct the interview.

Some problems were encountered in that some individuals on the mailing list had retired, sold out, or were in some other way no longer associated with the cattle business. In a few instances the assistance of local District Agriculturalists and ACC representatives was utilized to contact lease holders. In order to retain randomness, a number of names was secured from each contact and a random selection was made from the names provided. It was deemed necessary to define a minimum size operation in each of the nine zones in order to survey cattle operators representative of each area. On advice of the ACC representatives and local District Agriculturalists, a lower limit of approximately 30 cows per operation was taken as a minimum acceptable size of operation for survey purposes. The interviews were carried out during March and April of 1984. Zones closest to Edmonton (Zone 6 and the Southern part of Zone 8) were

surveyed first so that any problems with the interview format could be corrected while in the Edmonton area. Next, the outlying areas were surveyed (Zones 1,2,3,4 and 9). Lastly, Zones 5 and 7 and the northern portion of Zone 8 were surveyed. The final distribution of interviewees is given in Table III.1.

Individual operations surveyed varied greatly in size, quality of record keeping, and responsiveness to the survey. Some problems were encountered with interviewees. Farmers and ranchers active in calving and then early field work were unavailable at interview time in some cases. Approximately one third of the individuals contacted refused interviews, and three did not keep appointments. Many individuals contacted complained of being over-surveyed. The secondary list of alternates was utilized to compile the necessary number of interviews in all zones. One of the interviewees in one of the most distant zones who did not keep an appointment was not replaced with an alternate interviewee, due to time and expense. Thus a total of 49 interviews was conducted. Although no individuals surveyed refused to answer any questions, a few operators were only able to offer 'guesstimates' to questions posed. These poorer responses were primarily in the area of capital investment, however, and not in the more critical areas of actual physical numbers of cattle or acreage in pasture, crops etc.. Questions regarding liabilities were not asked of interviewees due to the reluctance of many individuals to disclose this type of information.

**B. Summary of Survey Results**

The random survey method employed provided a range of cattle operations displaying various physical and managerial differences. A short summary of notable characteristics is presented below.

Of the 49 operators surveyed, 24 utilized lease land. Approximately 8 of those who had individual leases also utilized community pasture, in the form of community association lease or government grazing reserves or forest grazing permits. It was thus possible to arrive at an approximate AUM cost for utilizing these types of pasture for these areas as well.

Table III.1: SURVEY DESIGN

| Zone | Number of Operators Surveyed |
|---|---|
| 1 | 4 |
| 2 | 6 |
| 3 | 3 |
| 4 | 4 |
| 5 | 6 |
| 6 | 8 |
| 7 | 6 |
| 8 | 8 |
| 9 | 4 |
| Total | 49 |

The size of cattle operations varied considerably. The smallest herd contained 25 cows, while the largest contained approximately 630 cows. As might be expected, the size of the land base also diverged greatly. The smallest operation in terms of land base was comprised of 80 acres ( 32.0 ha.) of deeded land and 80 acres of rented land. The largest land base encountered was an operation composed of 20,378 acres ( 8246.9 ha.). The largest lease holding was 13,899 acres ( 5624.8 ha.) of land. Table III.2 outlines some physical attributes of the operations being examined.

Many operators carried out grain farming in addition to the cattle operation. Others operated strictly cattle oriented ranches, with the land base utilized for pasture and feed production. In discussing costs incurred through lease utilization, a useful breakdown into fixed and variable costs may be employed.

Fixed costs of pasture utilization are the annual rental fees and municipal taxes. These are costs that all lessees must incur annually. Since the municipal taxes are based on the mill rate as per land values, taxes varied with land values. Three of the nine representative operations had taxes less than annual rental fees. These were the central mid-size, central small-size, and northern mid-size operations.[41] On average, taxes in these operations were 16% lower than the annual rental fees, with a range of taxes as 73% to 95% of the annual rental fee values. All other representative operations reported taxes greater than annual lease fees. On average taxes were 126% of annual rental fees. The range of tax as a percentage of annual rental fees for these operations was 18.9% to 267.9%. The highest and lowest rental rates and taxes for the surveyed operations were as follows. Based on dollars per animal unit, the highest rental fees were $19.40 , and the lowest were $9.75. The highest taxes per animal unit were $37.69, and the lowest were $4.35.

The variable costs associated with utilizing lease were greatest in terms of fence and water development. Three cost scenarios were developed from these figures, a low, a medium, and a high set of costs. The highest costs for water development were reported in the southern,

---

[41]These groupings of operations are explained in the following chapter.

Table III.2 INVENTORIES OF SAMPLE RANCHES

| PRODUCT | MEAN | STANDARD DEVIATION | RANGE |
|---|---|---|---|
| LEASE | | | |
| Number of Cows | 189.3 | 187.7 | 25-650 |
| Number of Yearlings | 134.3 | 120.7 | 0-303 |
| Pasture[1] | | | |
| Native Deeded | 854.0 | 1378.5 | 0-5042 |
| Native Lease | 2574.5 | 4156.6 | 88-16721 |
| Improved Deeded | 353.4 | 762.1 | 0-800 |
| Improved Lease | 50.0 | 126.8 | 0-600 |
| Grain | 116.0 | 193.9 | 0-580 |
| Crop | 224.96 | 331.9 | 0-607 |
| Oilseed | 49.76 | 137.7 | 0-500 |
| Hay | 314.5 | 321.6 | 0-1250 |
| Silage | 90.8 | 142.9 | 0-580 |
| NON-LEASE | | | |
| Number of Cows | 133.9 | 139.3 | 25-500 |
| Number of Yearlings | 165.3 | 261.2 | 0-580 |
| Pasture | | | |
| Native Deeded | 608.7 | 1385.2 | 0-7000 |
| Improved Deeded | 246.7 | 365.4 | 0-800 |
| Grain | 129.5 | 322.3 | 0-800 |
| Crop | 266.75 | 400.4 | 0-1575 |
| Oilseed | 80.68 | 164.1 | 0-140 |
| Hay | 156.0 | 175.9 | 0-800 |
| Silage | 30.2 | 59.26 | 0-200 |

[1]Forage and grain entries are in acres.

dry regions, and the highest costs reported for fence development were in the northern regions where in many cases brush had to be cleared on fence line before fence could be built or repaired. In addition, those individuals who reported undertaking range improvement activities reported high costs of clearing and breaking, particularly in the northern regions where tree and brush cover is extensive.

A number of questions asked in the interviews dealt with external effects not expressible in monetary terms. These values are not included in the analysis carried out with the simulation model, as non-quantifiable variables cannot be handled by the model. They are, however, important in the characterization of the use of lease land in the Province, especially in light of, primarily, equity considerations.

Interviewees were asked their perceptions about the security of tenure they experienced on their lease lands.[42] Most felt that their tenure was secure with 14 interviewees stating that security of tenure was good or very good. Six felt it was acceptable and four felt it was poor. Most interviewees had ten- or five-year leases. Reasons expressed for poor security were: (1)recreation priorities in their areas for which their lease was being considered; (2)highway proposals through lease land; and (3)wildlife habitat priorities being identified on their lease holdings. In terms of length of tenure, eight interwiewees stated that they felt that the lease tenures were too short on which to base operating plans (five of these individuals held annual leases).

A second question regarding non-quantifiable aspects of utilizing lease land was the issue of public access. Problems with public access were reported by nine lessees, most relating to gates being left open or damaged, allowing cattle to roam out of their restricted areas. Fence cutting and various kinds of vandalism were also reported, and two interviewees reported losing cattle (presumably to thieves). Minor problems were experienced by four interviewees, and 11 reported no problems.

---

[42] That is, they were asked if they felt that their lease might be revoked for any reason in the near future. Those individuals who did not think that this might occur, or those that had had their lease agreement for a number of years were considered to have secure tenure.

Another major problem identified by lessees was brush encroachment. Half of the interviewees indicated that this was a problem, and six of these that it was the most serious problem on their lease lands. Many cleared brush annually, but estimated that the encroachment of brush was greater than they were able to clear. In some cases they were restricted from clearing as much brush as they would have liked to because their leases were considered wildlife habitat areas, where the brush cover was needed for browse or cover for moose, deer, etc..

Others said that natural predators were of concern. Wolves and bears were the main predators identified. Other wildlife problems were created by beavers causing flooding, and other larger animals breaking fence.

Poison weed was considered a problem by one interviewee, and salinity of lease soil was also identified as a problem by one individual.

The following chapter outlines the means by which the survey data collected was prepared for analysis.

## IV. Data Utilization

In order to perform simulation analysis to determine the value of lease land to operators, several representative farms were created from the in-person survey data. The following paragraphs outline the procedures used to effect this process.

For purposes of comparing quality of pasture land, the division of the Province made by the Public Lands Division of Alberta Energy and Natural Resources was adopted. These divisions approximate differences in carrying capacity of grazing lands in the province, and the resulting regions may be described as southern, central and northern regions ( Figure IV.1). In terms of the previous nine zones used for sampling purposes, zones 1, 2, and 3 roughly correspond to the southern grazing region, zones 4,5,6, and the southern part of 8 correspond to the central region, and zones 7,9, and the northern portion of 8 correspond to the northern region. The 49 respondents were thus grouped into three regions.

A second procedure utilized in characterizing operations was to divide survey respondents into categories. Three sizes were chosen in each region, based upon number of cows in the herd and size of the land base (including lease land). Thus large, midsize, and small size categories were identified as typical farm/ranch units in each of the three regions ( southern, central, and northern).

Division was carried out in each category to distinguish between operations with lease holdings and those without lease land.

Operations of similar region, land size and cattle numbers were then combined to create a representative operation for each combination of characteristics. Categories of cattle, i.e. bulls, cows, replacement heifers, feeders, etc. were recorded for each operation in any given group,and their numerical average determined and used as the number of animals in that category for that representative operation. Similarily, acreages of cereals, hay, tame pasture, wild pasture, etc. were recorded, and their numerical average used for the representative operation. Figure IV.2 shows a matrix displaying the different groups.

Three types of data are utilized for modelling purposes; primary (survey), base file, and secondary. Primary data have been collected through the in-person survey, and are thus collected specifically for this study and applicable to the simulation model being utilized. Base file data are endogenous to the simulation model being utilized. These data have been developed from biological, chemical, and engineering experiments carried out at various western Agriculture Canada research stations. As new research data has evolved, it has been incorporated into the base data file.[43] The version of the simulation model utilized in this study pertains to 1983, and is thus considered to be suitably up to date. The option exists in most cases to override the base data and substitute primary data. Where this was possible it was carried out. The third type of data are secondary, that is, data which have been collected for different purposes, and adapted to this study. A typical example of secondary data are Provincial or Canadian agricultural statistics. The simulation model data requirements are extensive, as modelling of any farm operation typically takes into consideration many activities and interactions. Data requirements can be summarized into the following kinds:

1. physical inventories (land, labour and capital inputs);
2. costs of inputs and prices of outputs;
3. specific production systems; and
4. transformation rates within those production systems.

The following paragraphs outline the sources of this information.

**A. Inventories**

Physical inventories were obtained directly from survey respondents. Averaging inventories of operators surveyed in each of the eighteen categories provided a base inventory for the starting year of the model (1983).

Each operator had a particular set of machines and buildings, not necessarily similar to that of other operators in his assigned grouping. However, there do exist similarities in methods

---

[43] Sonntag, B. and Klein, K., 1979., p.1.

Figure IV.1 Public Lands Divison Grazing Zones of Alberta

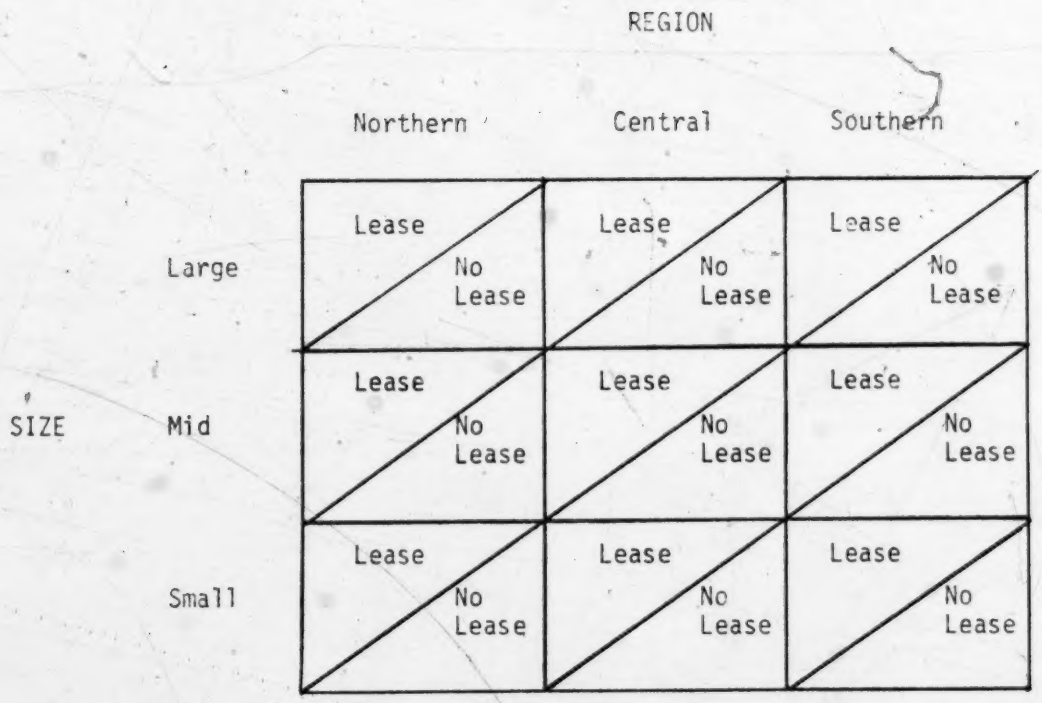



Figure IV.2 Matrix of Representative Cattle Operations

of crop production, and building needs. Representative operations were created by determining the most common methods of seeding, haying etc.; the machines best suited for those methods, and most common in the inventories of sample operators. Building needs were examined in light of typical machinery, crop yields, animal numbers, and weather conditions to select representative buildings for each group. Since most cattle operators in the northern regions experience more severe winter weather than operators in the south, animal shelter requirements are greater. Hence buildings deemed representative for each geographical location, machinery, and livestock were designated for each representative operation.

Livestock buildings were described by type,(i.e. minimal shelter, shed, etc.) year new, and number of head of cows, calves, etc. which they would hold. Machinery inventories were listed by type of machine, size, year new and horse power if applicable. Land inventories by acre were divided into categories for pasture, grain, and hay. Type of grain and pasture were also specified. Grain and hay inventories on hand at the beginning of the operation were also specified.

One operator and a small amount of family labour was assumed. Where additional labour was required for large operations, hours per biweekly period and wage rate were specified. The amount of part-time labour hired was the residual labour required each month after fully utilizing full-time employees and unpaid family labour. Wage rates for farm labour were derived from statistics presented by Alberta Agriculture and Statistics Canada. Where full time labour was utilized, it was assumed room and board would be provided in addition to an annual wage.[44] Full time labour received $9,840.00 annually, and part-time labour received $5.32 on an hourly basis.

---

[44]Both Statistics Canada and Alberta Agriculture statistics provide wage rates with or without room and board.

**B. Costs of Inputs and Prices of Outputs**

Reported costs of inputs were also averaged among the operations in any given size group and region. These are items such as fertilizer costs, veterinary and medical expenses, fuel costs, land taxes, fencing costs etc.. Whenever data collected from primary sources were applicable to the parameters of the model they were utilized.

Land was not purchased in any of the simulations, but the value of land was needed to assess the value of land assets.

The derivation of land values and annual costs posed some problems. Land values were estimated from data collected by D.L. Hoover and S.F. Sept. [45] Their publication identifies ranges of land values in regions of Alberta displaying homogeneous farmland market characteristics, while taking into account the recent reversal (downward trend) in real estate prices. The location of the representative farms created for this study were identified in these regions and their real estate values determined. It is important to recognize that the land values in each region vary considerably with various factors that influence land values, and as such these values can only be considered estimates. Values were estimated for pasture land, hay land and crop land.

Annual costs on land were determined from tax data provided by operators throughout Alberta. Similarly, annual rental fees and taxes on lease land were provided by operators.

Livestock prices were obtained from secondary sources. The Market Analysis Branch of Alberta Agriculture publishes a quarterly report entitled *Livestock Situation & Outlook* in which cattle prices for each category of cattle are listed monthly and quarterly. In addition a weighted annual average is presented, and it was this price which was utilized for cattle prices in the model.

Prices received for grain were obtained from the Statistics Branch of Alberta Agriculture. Statistics for major crops in Alberta are recorded as average annual farm gate values by this department.

---

[45]Deloitte, Haskins & Sells Associates. May 1984. "Agricultural Land Values - Rural and Rural/Urban Fringe, What's Happening?".

The computer simulation model was instructed to purchase new machinery, and to sell it at 90% of its maximum useful life. Machinery costs are provided in the base data of the computer model, and the useful life of a machine is calculated by the model based on hours of use, age of the machine, etc..

Consumption and income tax data were compiled from a number of sources. No off-farm income was included. Minimum living expenses were estimated from a sample of 26 operators participating in the Farm Management Field Lab operated through the Department of Rural Economy at the University of Alberta. A minimum living expense of $14,715.00 was calculated. An additional 5% of positive net income was included as consumption income.

Personal tax exemptions were determined for a family consisting of two adults and two children and used as a proxy for personal exemptions. It was assumed that the spouse of the operator did not have off-farm employment. A basic deduction for an operator of $3,770.00, plus an additional $710.00 per child was adopted. Spousal deduction was $3,300.00. Thus total personal deductions were $8,490.00.[46] The 1983 Provincial tax rate of 38.5% was applied to all operations.

Many financial considerations are also handled by the computer model. A real annual interest rate of 5% was imposed on all loans. Repayment periods for loans can be specifed for different capital purchases and for different years. Only short term ( 90 day operating capital) loans were permitted during simulations at an annual interest rate of 9%. (Reported returns to equity are thus returns to assets only.) Cash on hand at the beginning of each simulation was specified as $10,000.00 for all operations.

**C. Production Systems**

Crop and forage production data were handled in a similar manner to that described for beef production. Pasture utilization methods were based on geographical and interview information. Methods of improving pasture were directed toward improving native pasture, and

---

[46]Taxation Canada, Income Tax Enquiry Office, Edmonton. May 29th, 1984.

in all cases an operator's own machine and labour were chosen over custom work.

Pasture yields were taken from primary data, as were pasture improvement costs, which included costs of clearing, breaking, cultivating, seeding, seed, and fence and water development. Native range condition was adapted from primary data as well. Lease pasture was always specified as lower quality to reflect characteristic poorer quality pasture yields from lease lands.

Cropping alternatives were based upon the machinery types used by interviewees, geographical location, and reported crops. Cropping programs were set at 3/4 crop - 1/4 summerfallow for the northern regions, 2/3 crop - 1/3 summerfallow for central regions, and 1/2 crop - 1/2 summerfallow for southern regions.

Oilseed as a percentage of summerfallow crop acres in 2/3 and 3/4 rotations were set at 20%, and in 1/2 - 1/2 rotations at 10%.[47] Since 1/2 - 1/2 crop rotations occur in southern regions where less oilseed is produced, the estimate of 10% was used. No oilseed was allowed in southern regions in the eastern portion of the Province where climatic conditions generally preclude oilseed cropping, and where no oilseed inventories were reported by interviewees. Pasture production, crop, hay, and silage yields were all determined from primary data.

The livestock production system was modelled through averaging of respondents' herd sizes, cow replacement rates, number of stocker animals, number of long yearlings, etc.. The capability exists in the model to choose a cow-calf production system yielding calves sold at weaning, feeders sold in spring as stockers, etc.. Since the purpose of this study is to examine the utilization of lease pasture, a beef production system utilizing extensive pasture was chosen. All simulations were characterized as a 'cow-calf - stocker - pasture - sell long yearlings in fall' production system.

---

[47]These percentages were based on an assumption that oilseed crops occur approximately every four years in a given operation in Alberta.

**D. Transformation Rates**

Feeding methods were essentially determined from primary data, and trends [48] in the northern, central and southern regions were identified and modelled. Proportions of pasture utilized for energy requirement vary with type of pasture, amount of pasture used as feed, and as length of the winter season dictates. Pasture is utilized for a shorter season in the northern regions. Base data was utilized for rates of gain for all types of livestock except for calves, where primary data was available. Conception rates, calving rates, weight gain rates, etc. were all provided by base data.

Transformation rates are primarily endogenous to the simulation model. Where primary data were collected they were utilized to enhance accuracy.

All prices, costs, values, consumption and tax information, in additon to all information obtained from operators was stated in 1983 terms. The simulation model is run for 10 years and all input costs and output prices are held constant for these years. Interest on loans is set at a real annual interest rate of 5%.

The next chapter (chapter V) outlines the method by which the quantifiable data were utilized in the simulation model, and outlines the processes of simulation and experimentation.

---

[48]Type and amounts of feed used as reported by interviewees were used to establish common practices.

## V. Research Methods

### A. The Process of Simulation

Central to the analysis of the value of crown lease lands to operators is a simulation model developed by Sonntag et.al.. The survey information collected has been adapted to model several representative cattle operations, and these operations have been subjected to leasing alternatives to determine the costs and returns attributable to the utilization or non-utilization of lease lands. The following paragraphs outline the means and reasoning by which this task was effected.

The process of simulation requires two distinct phases: (1)setting up a model of a real situation or system (modelling); and (2)performing experiments on that model (experimentation).

Simulation modelling is desirable because it is a technique which is well suited to the dynamic characteristics of time-dependent agricultural systems. Agricultural systems are continuously affected by their previous development and the environment around them. It is possible to utilize mathematical techniques when investigating essentially simple systems. "For most systems, however, it is either not possible or not practical to use any mathematical technique, however sophisticated, to adequately represent, or model, a system's behavior over time. In fact it is necessary to get away from any attempt at looking for "best" or "optimal" solutions and to try instead to follow, in a rather naive way, the future consequences of present decisions and external changes."[49]

The use or non-use of lease land as opposed to private rental or purchase may have long term effects on the economics of a given cattle operation. Thus a simulation model is very appropriate to study a cattle operation's growth and development and the manner in which it is affected through the use or non-use of lease land.

---

[49]Charleton and Thompson, p.373-374.

The limitations involved in utilizing simulation techniques lie primarily in the construction of the simulation model. System analysis is the most important part, and a model based on too complicated or too simple analysis will each create problems. Too little knowledge upon which to base a system may limit its scope, while too many features of the real system may make it intractable.

**B. The Simulation Model**

The practice of cattle ranching or farming is one which is characterized by a complex interaction of biological, physical, chemical, and economic relationships. The complexity of each of these components has fostered indepth study of each in isolation. To the cattle rancher or farmer, these individual components are the foundation of his livelihood, yet rarely would he consider them in their individual nature. Rather, he views his operation as a synthesis of these components, as a whole. The interaction of these components makes the decisions of the farmer necessarily depend upon their interaction. It is the interaction of these components which the simulation model being used in this study attempts to characterize. "A simulation model can more easily accommodate the complex biological, physical, chemical, and economic interrelationships involved in production than can models which must fit within the often restrictive confines of particular algorithms."[50]

Just as an operation may be viewed as a system of components, so may a farming operation be characterized as a system of outputs. In most cases ranchers or farmers not only produce beef, but also produce grain, some other livestock, forage etc.. In order to as accurately as possible simulate a true operation, these additional outputs must also be considered.

The simulation model developed by B. Sonntag and K. Klein, and used in this study, exemplifies these ideas. It is a bioeconomic simulation model which incorporates important biological, physical and economic interrelationships to produce several products. Time is also

---

[50]Sonntag, B. and Klein, K., 1977., p.1.

treated as a dependent variable in that productive units needed as inputs for production of other outputs are only available as their production dictates.

The model does not produce an optimal solution. Rather, it traces the detailed workings of the system, simulating variations in inputs with interrelationships of characteristics of production. Primary products are utilized in the production of secondary products, such as soil, fertilizer, and labour to produce forage, and which in turn is used as a primary input to cattle. The model can simulate various management strategies over a ten year period. Production alternatives exist for beef and feeder enterprises, a forage enterprise, and a crop enterprise (see Figures V.1, V.2, V.3, and V.4).

The model is composed of three main sections, the base model FORTRAN program, a base data file , and a control data file. Control data are supplied by the user of the model through input of information of the following types:

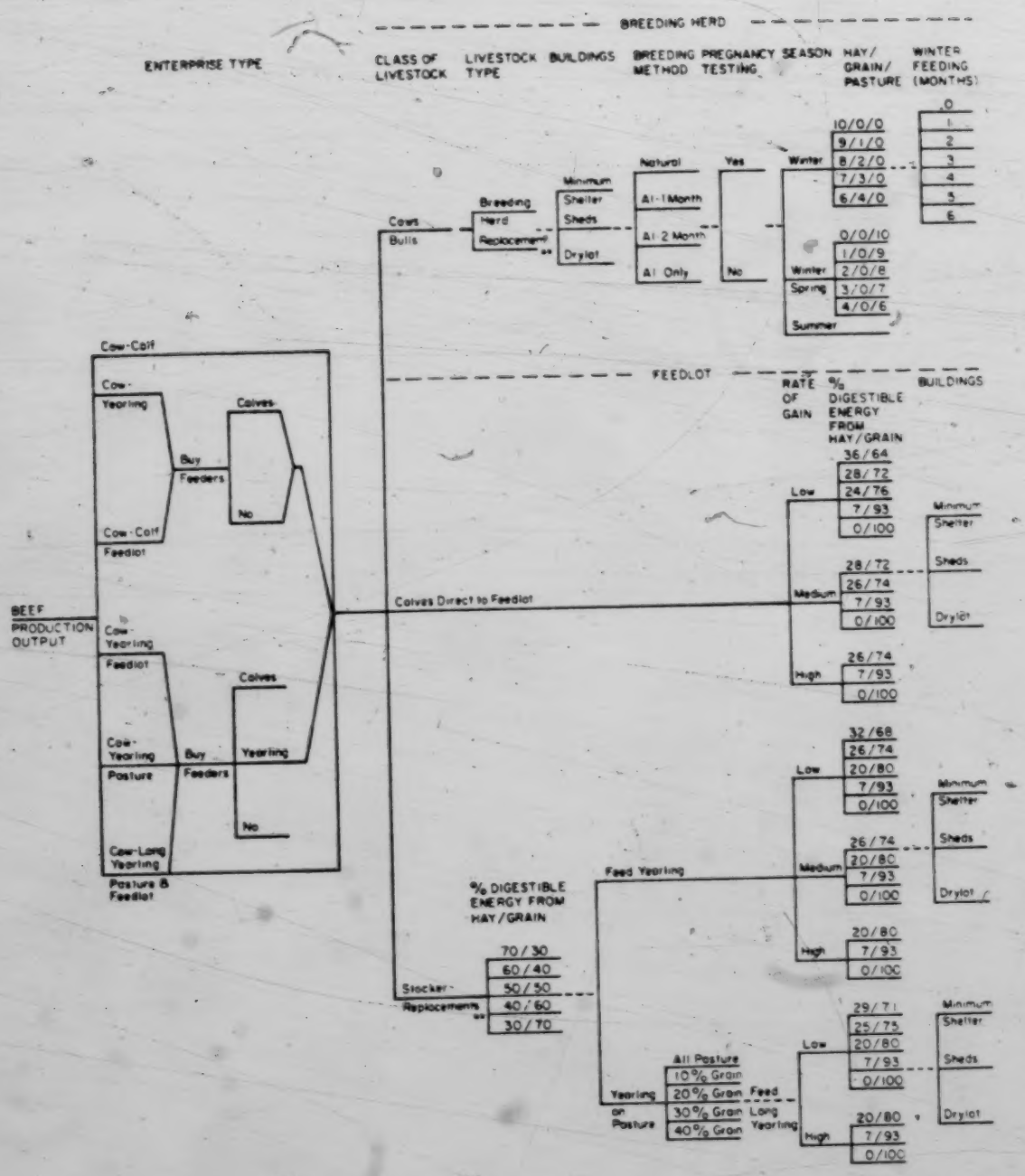
1. Physical inventories of buildings, livestock, land, machinery , products, and financial items. These inventories are detailed in terms of types, capacity, amount, and/or age;
2. Permanent and seasonal labour ( if applicable ) on a bi-weekly schedule;
3. Costs of inputs and prices of outputs.
4. Transformation rates pertaining to technical processes: conception rates, rates of gain, crop yields, etc.;
5. Those production systems which are to be evaluated; and
6. Consumption requirements of the operator and his family. [51]

The model then produces an output which contains the following information:

1. Physical activity levels - number of cows, bulls, etc., product sales volume, crop acreages, etc.;
2. Inventories, capacities, types and capital values;
3. Financial situation - assets, debts, net worth, cash balance etc.; and
4. Resource flows.[52]

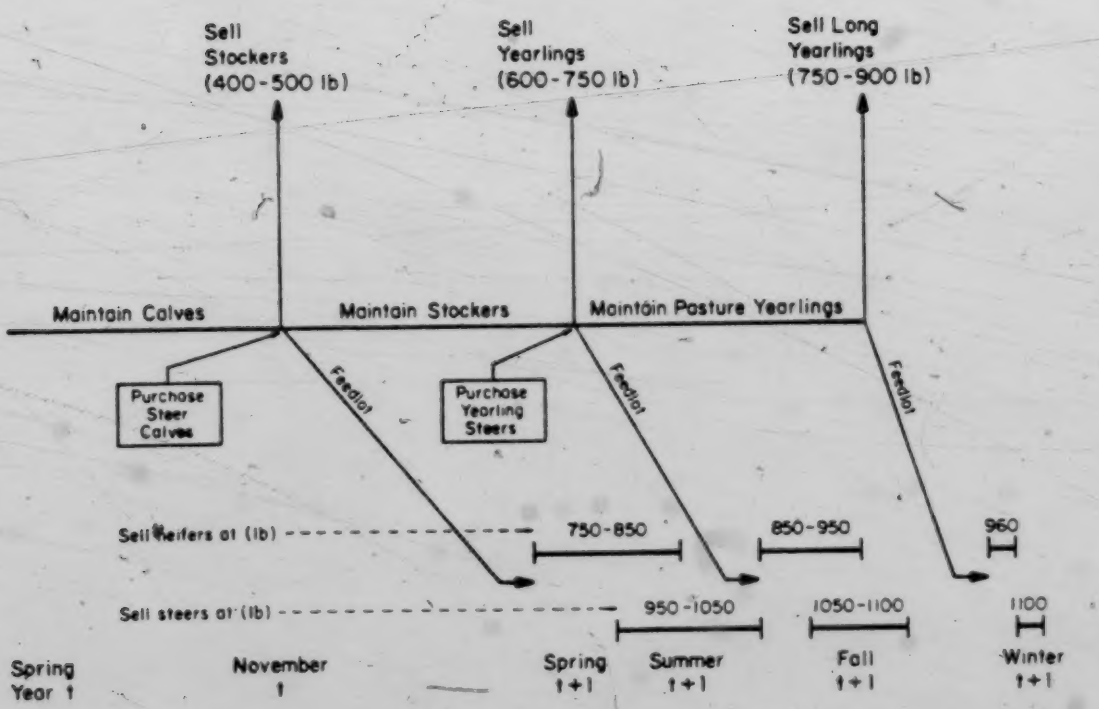
---

[51]For a further description of the inputs for this model see Sonntag and Klein.
[52]Sonntag, B.H. and Klein, K., p.4.



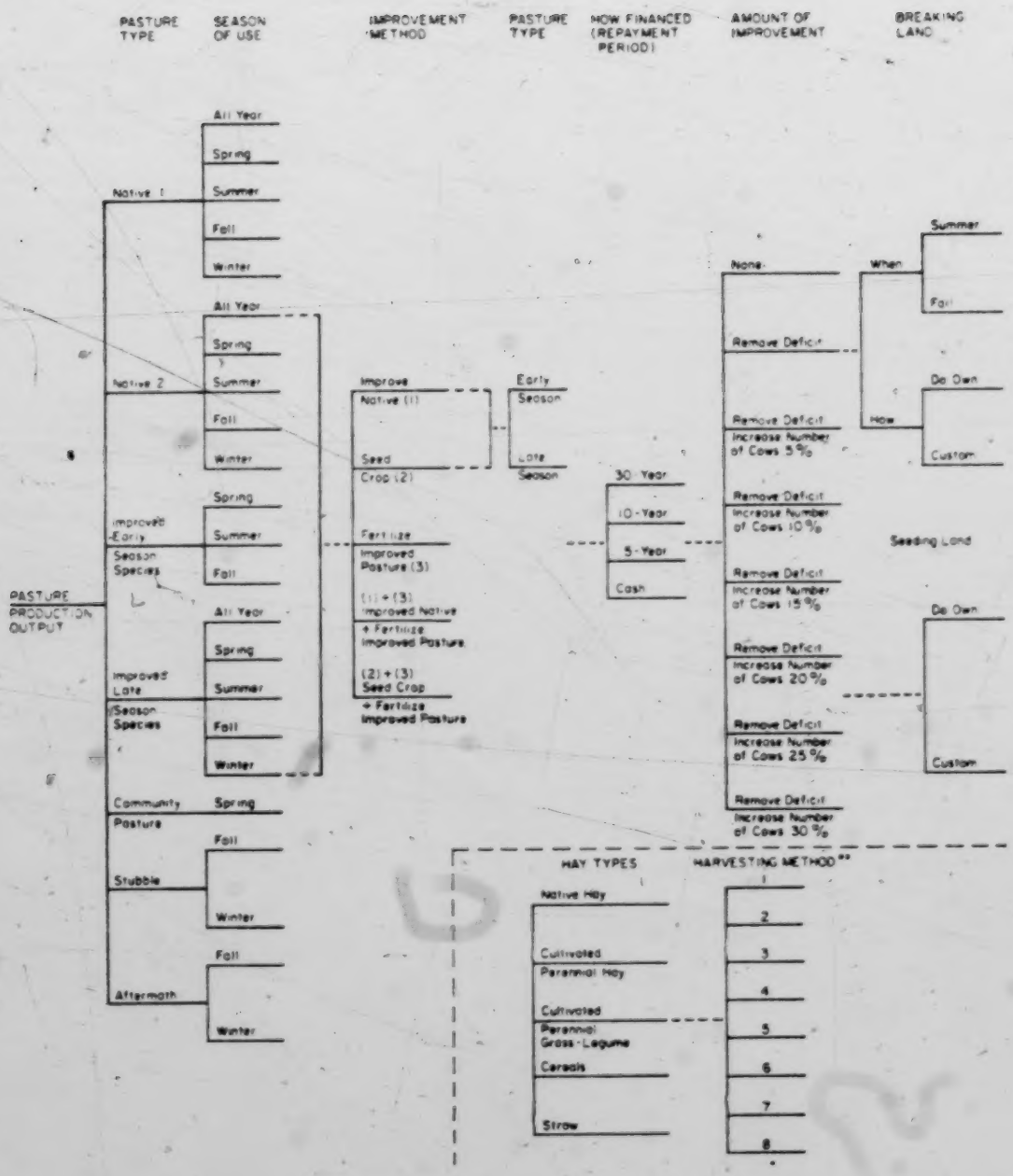

SOURCE: Agriculture Canada. 1979. A Beef Forage Grain Production Model for Farms in Western Canada.

Figure V.1 Production Alternatives For The Beef Enterprise



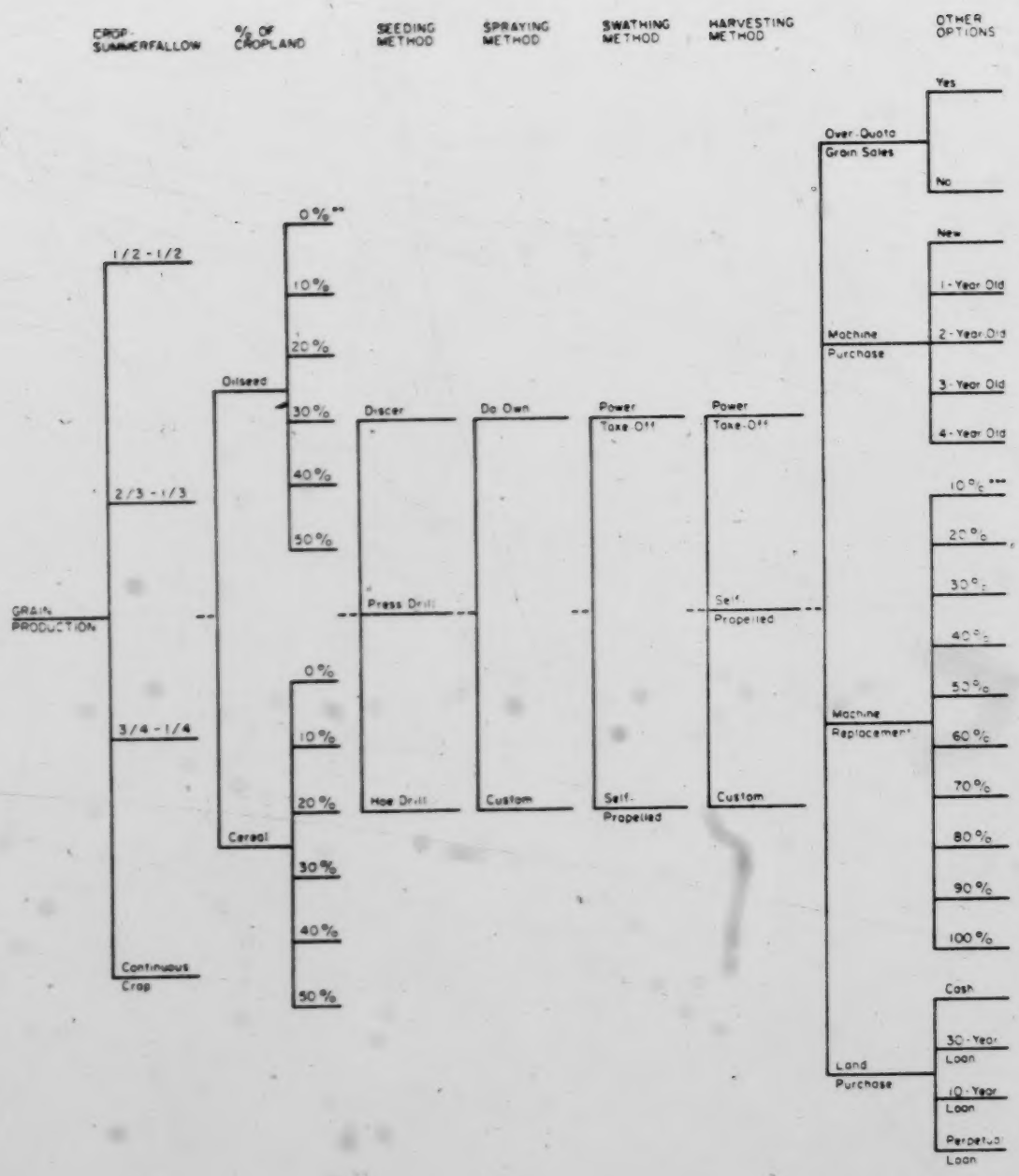

SOURCE: Agriculture Canada. 1979. A Beef Forage Grain Production Model for Farms in Western Canada.

Figure V.2 Production Alternatives For Feeder Cattle




SOURCE: Agriculture Canada. 1979. A Beef Forage Grain Production Model for Farms in Western Canada.

Figure V.3 Production Alternatives For The Forage Enterprise




SOURCE: Agriculture Canada. 1979. A Beef Forage Grain Production Model for Farms in Western Canada.

Figure V.4 Production Alternatives For The Crop Enterprise

In the present situation, the model is adapted to incorporate not only the above parameters, but also the effects of crown lease land utilization on cattle operations. In this way, a 'value' may be attributed to the use of lands other than deeded.

There exist in the model a number of built-in alternatives which allow for the use of pasture land. These have been utilized. There are other parameters which are not so readily applied to the model, which required some adaptations.

Once data were collected and the model was operationalized, attention was focused on aspects of lease land utilization that could be controlled endogenously to the model. In estimating the value of lease lands two distinct aspects of firm theory were considered: input costs and output prices. Output prices were derived from various secondary data sources. Costs attributable to lease utilization were of particular concern, not only because they define the net value attributable to lease utilization, but because they are the most difficult to determine, and thus often incompletely or inaccurately reported.

Costs identified by crown lease land users can be divided into two categories; fixed costs and variable costs. Fixed costs are costs such as annual rental fees and taxes. Taxes and annual rental fees were obtained from interview respondents and used to derive a cost per acre for utilizing crown lease land in each representative operation. In this way a fixed cost per acre was determined for lease land.

Another cost incurred by all users of lease land is an assignment or transfer fee. Assignment fees are only applicable in cases where a lessee acquires the use of lease land directly from the Public Lands Division. In cases where lease land holdings are transferred from one member of a family or company to another, or inherited, or received by a beneficiary of an estate, etc.,[53] the assignment fee is adjusted downward.[54] Since the assignment fee is not generally the same between operators, it is handled separately from other fixed costs in Chapter VI.

---

[53] For further information refer to The Public Lands Act, Alberta Regulation 155/76.

[54] Transfers between family members command a fee of $50.00.

The remaining costs associated with lease utilization may be termed variable. These costs vary both over time and between users of lease land holdings. Four frequently incurred costs not explicitly handled by the model are often substantial and therefore important considerations. The author met with Dr. Klein to assess the possibilities of modifying the simulation model to accommodate these specific costs identified by lease holders. Four additional variables were subsequently entered into the model. These four variables handled:

1. The cost of transporting cattle to lease lands in cases where lease is not adjacent to deeded land;
2. An estimate of labour expended (in hours) to transport cattle to lease;
3. A lump sum cost applicable to water and fence development on lease land; and
4. An annual fee for maintenance of fence and water developments.

These additional variables allowed the most significant variable costs attributable to lease land utilization to be handled explicitly. Data provided by survey respondents were thus entered into these four categories.

Other variable costs to be considered are range improvement costs. Although the Province offers a range improvement program through the Public Lands Division, many operators carry out improvements on their own; or are only partially funded by the Province. These costs are highly variable, depending primarily on the quantity of brush or tree cover, soil type, and of course on the proportion of costs undertaken by the lessee. Due to this variability these costs are examined exogenously to the model. Low, medium, and high cost scenarios were developed from the survey data, and these costs were imposed on a given operation after the main analysis was carried out. These costs are presented in the analysis of range improvement costs section in Chapter VI.

A problem arises when valuing lump sum costs such as water and fence development costs because they usually only occur once during a ten- or fifteen-year period, depending on the life span of the improvements (the life span of fencing is generally considered to be in the

neighborhood of 25 years).[55] If the year of investment was known, the costs of these improvements can be determined by depreciating their present value. In surveying respondents, the years(s) of improvements were unknown in the majority of cases. To overcome this dilemma, all improvements and lump sum costs have been arbitrarily attributed to the second year of operation.

Other un-priced costs reported by operators are not included in the analysis. Losses due to brush encroachment, wildlife predation, vandalism etc., although legitimate, are difficult to quantify, and therefore difficult to analyze empirically.

**C. Simulation of Varying Quantities of Lease Land**

Comparing the use or non-use of crown grazing lands in an operation required simulations of varying quantities of lease land on the representative operations. The creation of 18 representative operations provided 9 different lease, and 9 different non-lease utilizing situations. These operations were run through the simulation model and are used as reference points with which to compare the varying lease simulations.

To simulate a range of quantities of lease land, each representative operation utilizing crown lease land had three distinct simulations imposed upon it. Simulations were created for 2/3 lease, 1/3 lease, and removal of lease. The operations not holding lease land were not provided incremental lease land due to complications arising from transfer cost values. If the lease were acquired directly from the Public Lands Division, assignment fees could be calculated and added as an initial cost of lease utilization. Since public lease lands are unavailable in a majority of areas of the province however, this method abstracts from reality. Leases utilized in these areas are generally acquired through payment of high permit values or through transfers within families, etc.. Permit values are unknown, and as such cannot be incorporated into the cost of lease utilization without abstracting from reality through gross assumptions. The following adaptations were made to effect simulations on the lease holding

---

[55]The Farm Business Management Section. *Costs of Owning Pasture*. p.13 .

operations.

The total lease land base (in acres) and variable costs associated with lease utilization were diminished proportionally for each lease simulation. Thus for the 2/3 lease simulation, lease pasture acreage was decreased by 1/3, as were variable costs . Since fixed costs of lease utilization are expressed in the model on a per acre basis, these costs are automatically adjusted downward by the model with reduction in acreage of lease pasture. Since an operator with less lease pasture acreage would have less cattle (assuming that his pasture land were fully utilized), the herd size was also decreased by determining the carrying capacity of the lease pasture, and decreasing the herd size according to the number of animal units removed. Simulations were thus carried out for each of the nine representative operations containing crown lease pasture. The following chapter discusses the results of these simulations.

# VI. Results

## A. Method of Evaluation of Results

The simulation strategies outlined in the previous chapter were evaluated in two stages:

1. The ranch/farm net income for each representative operation, and simulation was derived from the 5th year of operation in the ten year simulation; and
2. The actual cost of getting a calf to market under each situation was determined.

In order to determine the impact of varying amounts of lease land on the net income of representative operations, year 5 of the 10 year simulation was examined in detail. This year was chosen for the following reasons.

During the first two years of the simulation run, various adjustments are occurring in inventories and outputs as the model utilizes the inventory data supplied and patterns the farm/ranch along specified production systems. As such, inventories are adjusted to reflect the needs of the specified production systems. Subsequent sales or purchases of inventory items tend to distort expenses and receipts, thus distorting the net income values during this first or second year transition period.

Costs of lump sum expenses for fence and water development were attributed to the second year of the operation. This value was determined from survey respondents who generally gave a value which had accrued over a period of 10 or more years. Analysis of simulation results in the second or third year may thus tend to over weight the significance of these costs.

By taking all of the above factors into consideration, the 5th year was chosen as most appropriate. Each simulation was examined in the 5th year to maintain consistency in analysis of the results.

Each simulation result includes a balance sheet, or statement of assets, liabilities, and owners equity, and a profit and loss statement, known also as an income statement.

The analysis of the balance sheet[56] was crucial to the examination of lease strategies. Altering lease land, owned land proportions affects the overall cattle operation, and the balance sheet shows the effect of this alteration upon assets, liabilities, and equity.

**Assets**

Assets are those things of value owned by the cattle operation for the purpose of fulfilling the goals of its owners. Assets are generally defined in terms of their liquidity. Current assets are those assets which are cash or which would normally be converted to cash or used up within the accounting year. Current assets include cash, crops and livestock. Fixed assets include land, buildings, and machinery.

There are two main approaches to valuing assets. The first is to value assets at cost with deductions for depreciation as assets are used up in production. The second approach is to value assets at their market value at the time the statement is prepared. It is this latter approach which is taken in this study. "Since markets exist for farm products at various stages of the production process ( eg. calves at weaning can either be sold as feeders or kept and sold later as fat cattle), it is usual practice in farm accounting to value product inventory at market value."[57] Fixed assets do not display this rapid turnover, and are therefore generally valued on the basis of original cost less accumulated depreciation. However, original data obtained from survey respondents did not disclose acquisition years and values for many fixed assets, as operators simply did not recall this information. As such fixed assets are valued in the same manner as current assets.

**Liabilities**

Liabilities are claims held by persons or businesses outside of the accounting entity. Liabilities are also generally classified according to their liquidity. Because survey participants

---

[56]Balance sheet is an appropriate name for the contained information, as in accounting practices ASSETS=LIABILITIES+EQUITY, i.e. the contents of the sheet must balance in this way.
[57]Bauer et al., p.33.

were not questioned with regard to their liabilities, this portion of the balance sheet is necessarily brief. The assumption of a non-debt situation precluded utilization of term notes, mortgages, and other commitments as liabilities. While this assumption abstracts from reality no better results are derived from the assumption of an arbitrary debt load. Thus returns to equity are returns to assets.[58] Current liabilities listed in the balance sheet are interest payments on 90 day operating capital loans which were allowed.

**Equity**

Equity is a residual which can be derived through rearranging of the accounting equation into the form:

EQUITY=ASSETS-LIABILITIES

The method of valuing assets plays an important role in the interpretation of changes in equity from one year to the next.

Where fixed assets are valued at their market value, as in this study, changes in equity typically include a fixed assets adjustment,[59] addition of net income, contributions, withdrawals, and other gains and losses.

The equity portion of the balance sheet also displays the source of growth (or shrinkage) of the business. Any business growth shown in this study can be attributed primarily to the investment of net income back into the cattle operation, due to the assumptions of constant prices for fixed assets.

The relationship that beginning equity and ending equity bear to one another is of interest in determining the growth of a business. Percent equity change summarizes this relationship. Percent equity change is derived as follows:

Percent Equity Change = ending equity/beginning equity -1 x 100

---

[58] This aspect is discussed in the following section.

[59] The fixed asset adjustment is the difference between the market value of an asset and its net book value, i.e. its original cost less depreciation. (Bauer, et.al. p.34.)

A positive percent change figure means the business has grown, a zero percent change means the business has had no change, and a negative percent change means the owner's share in the business has declined.

Because lump sum expenditures on water and fence development are incurred by lessees in year two of the simulation, they do not appear as cattle expenses in year five (the year of analysis). Rather, these lump sum expenditures appear as reductions in cash assets, since the financing of these improvements reduces cash holdings (or adds to short-term debt where cash balances are zero or negative). It is thus important to observe differences in cash (and therefore current assets) to determine the effect of these and other similar expenditures on the cattle operation.

**Net Income**

Earning a profit from capital investment and from labour and management is an important objective of cattle operation operators, as in any business. As such, the net income summarized as a single line in the equity section of the balance sheet is shown in greater detail on the income statement. From an accounting stance, net income equals gross income less expenses. From an economic viewpoint, net income takes on the meaning of a residual for yet unrewarded factors of production, i.e. the capital. In this study, labour and management are already rewarded through salary and wage allocations. Salaries and wages were determined from agricultural statistics.[60] Thus the net income figure derived in this analysis is a return to capital. This method of allocating net income to labour and management is somewhat arbitrary, since farm corporations are overwhelmingly a tax management tool to the extent that salaries paid are not often a good indicator of the worth of the operator's labour and management devoted to the business.

---

[60] See Chapter IV on data collection for further detail.

**B. Capital Structure Analysis**

The capital structure of the cattle operations is revealed through the statements of Assets, Liabilities, and Equity. Table VI.1 shows the asset structure of the northern-large operations. Asset levels decrease when lease quantities are reduced. Fixed assets remain stable, while current assets decrease substantially due to reduction of livestock inventory. The shift away from current assets can be taken as a decline in the availability of working or operating capital. Total assets in the non lease using operation are only slightly lower than in the full lease operation.

Claims against the cattle operation are in two forms. The first is a debt claim (i.e. liabilities) and the second is a residual claim (i.e. equity) held by the owners of the operation. As lease land is decreased to the '2/3','1/3', and 'lease removed' quantities, short term liabilities increase. No liabilities are seen in the non-lease using operation. Ending equity decreases as lease land is removed. Ending equity in the non lease using operation is only slightly lower than the full lease operation.

Table VI.2 shows the asset structure of the northern midsize operation. Asset levels decrease when lease quantities are reduced. Fixed assets decrease slightly, while current assets decrease substantially due to reduction of livestock inventories. The shift away from current assets indicates a decline in working capital. Total assets in the non lease using operation are less than the '1/3 lease' operation. As lease land is decreased to the '1/3 lease' and 'lease removed' quantities, liabilities in terms of short term debt increase. No liabilities are seen in the non lease operation. Ending equity decreases as lease quantities are decreased, and is lowest in the non-lease using operation.

Table VI.3 shows the asset structure of the northern-small operations. Asset levels decrease as lease land is reduced. Fixed assets remain stable in lease operations. Current assets decline substantially as lease land is removed. Fixed and current assets are greater in the non-lease using operation. Total assets decline slightly as lease land is removed, due in the most part to reductions in current assets, implying again a reduction and shortage of operating

**Table VI.1: FARM BUSINESS SUMMARY FOR NORTHERN LARGE OPERATIONS**

Farm Statement at End of Fifth Year

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| ASSETS | | | | | |
| CURRENT ASSETS | | | | | |
| Cash | 120811 | 80181 | 27782 | -28555 | 238057 |
| Crops | | | | | |
| Mixed Hay | 120890 | 150759 | 182554 | 212929 | 88384 |
| Barley | 14178 | 14006 | 13836 | 13659 | 14064 |
| Oilseed | 4827 | 4827 | 4827 | 4827 | 4827 |
| Total Crop | 139895 | 169592 | 201217 | 231415 | 107275 |
| Livestock | | | | | |
| Bulls | 11000 | 9000 | 7000 | 6000 | 10000 |
| Cows | 114456 | 97252 | 81242 | 64516 | 103225 |
| Bred Heifers | 23708 | 19965 | 16845 | 13102 | 21836 |
| Repl. Heifers | 14467 | 12179 | 10271 | 8011 | 13322 |
| Steer Calves | 49390 | 42503 | 35189 | 27973 | 44656 |
| Heifer Calves | 29696 | 25499 | 21303 | 16785 | 26264 |
| Total Livestock | 242717 | 206398 | 171850 | 136387 | 219303 |
| TOTAL CURRENT ASSETS | 503423 | 456171 | 400849 | 339247 | 564635 |
| FIXED ASSETS | | | | | |
| Land | | | | | |
| Deeded Pasture | 311600 | 311600 | 311600 | 311600 | 311600 |
| Improved Pasture | 92000 | 92000 | 92000 | 92000 | 14440 |
| Crop Land | 317250 | 317250 | 317250 | 317250 | 317250 |
| Natural Hay Land | 240000 | 240000 | 240000 | 240000 | 240000 |
| Grass-Legume Hay Land | 175800 | 175800 | 175800 | 175800 | 175800 |
| Total Land | 1136650 | 1136650 | 1136650 | 1136650 | 1136650 |

**TABLE VI.1:Continued**

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| Total Buildings | 54156 | 54156 | 54156 | 54156 | 54156 |
| Total Machinery | 175054 | 175054 | 175054 | 175054 | 175054 |
| TOTAL FIXED ASSETS | 1365860 | 1365860 | 1365860 | 1365860 | 1288521 |
| Other Assets | 14524 | 2565 | 2244 | 0 | 14105 |
| TOTAL ASSETS | 1883807 | 1824596 | 1764465 | 1705107 | 1867261 |
| Liabilities | 0 | 187 | 1062 | 7908 | 0 |
| Beginning Equity | 1844232 | 1797855 | 1748890 | 1693989 | 1828109 |
| Total Net Income | 55914 | 42553 | 30187 | 18520 | 55199 |
| Living Expenses | 16339 | 15999 | 15674 | 15310 | 15310 |
| Income Tax | 0 | 0 | 0 | 0 | 0 |
| Equity Addition | 39575 | 26554 | 14513 | 3210 | 39152 |
| Ending Equity | 1883807 | 1824409 | 1763403 | 1697199 | 1867261 |
| Equity Change(%) | 2.15 | 1.48 | .83 | .19 | 2.14 |

## Table VI.2: FARM BUSINESS SUMMARY FOR NORTHERN MIDSIZE OPERATIONS

Farm Statement at End of Fifth Year

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| ASSETS | | | | | |
| CURRENT ASSETS | | | | | |
| Cash | 67886 | 50163 | 30636 | 3387 | 93660 |
| Crops | | | | | |
| Mixed Hay | 77898 | 86583 | 94630 | 102891 | 73960 |
| Barley | 17511 | 17462 | 17417 | 17368 | 17425 |
| Oilseed | 4065 | 4065 | 4065 | 4065 | 4065 |
| Total Crop | 99474 | 108110 | 116112 | 124324 | 95450 |
| Livestock | | | | | |
| Bulls | 4000 | 3000 | 3000 | 30000 | 3000 |
| Cows | 43727 | 38471 | 33214 | 27479 | 34169 |
| Bred Heifers | 8735 | 7487 | 6863 | 5615 | 6863 |
| Repl. Heifers | 5341 | 4578 | 4196 | 3433 | 4196 |
| Steer Calves | 18505 | 16353 | 14202 | 12050 | 14632 |
| Heifer Calves | 11444 | 9919 | 8393 | 7248 | 8774 |
| Total Livestock | 91752 | 79808 | 69868 | 58825 | 71634 |
| TOTAL CURRENT ASSETS | 259112 | 238081 | 216616 | 186536 | 260744 |
| FIXED ASSETS | | | | | |
| Land | | | | | |
| Deeded Pasture | 120600 | 120600 | 120600 | 120600 | 70000 |
| Improved Pasture | 123250 | 123250 | 123250 | 123250 | 65000 |
| Crop Land | 336600 | 336600 | 336600 | 336600 | 336600 |
| Natural Hay Land | 35000 | 35000 | 35000 | 35000 | 35000 |
| Grass-Legume Hay Land | 86800 | 86800 | 86800 | 86800 | 86800 |
| Total Land | 702250 | 702250 | 702250 | 702250 | 593400 |

**TABLE VI.2:Continued**

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| Total Buildings | 45184 | 45184 | 45184 | 45184 | 45184 |
| Total Machinery | 133352 | 130235 | 130235 | 130235 | 134153 |
| TOTAL FIXED ASSETS | 880786 | 877669 | 877669 | 877669 | 772737 |
| Other Assets | 3423 | 4656 | 1565 | 0 | 10197 |
| TOTAL ASSETS | 1143321 | 1120406 | 1094285 | 1064205 | 1043678 |
| Liabilities | 0 | 0 | 200 | 375 | 0 |
| Beginning Equity | 1138169 | 1119197 | 1099563 | 1073445 | 1044055 |
| Total Net Income | 19867 | 15924 | 10802 | 5100 | 14338 |
| Living Expenses | 14715 | 14715 | 14715 | 14715 | 14715 |
| Income Tax | 0 | 0 | 0 | 0 | 0 |
| Equity Addition | 5152 | 1209 | -3913 | -9615 | -377 |
| Ending Equity | 1143321 | 1120406 | 1095650 | 1063830 | 1043678 |
| Equity Change(%) | .45 | .12 | -.36 | -.90 | .04 |

## Table VI.3: FARM BUSINESS SUMMARY FOR NORTHERN SMALL OPERATIONS

Farm Statement at End of Fifth Year

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| ASSETS | | | | | |
| CURRENT ASSETS | | | | | |
| Cash | -38689 | -47233 | -64430 | -64051 | -32046 |
| Crops | | | | | |
| Mixed Hay | 8342 | 12114 | 16056 | 14683 | 6226 |
| Barley | 7647 | 7624 | 7598 | 7575 | 7637 |
| Oilseed | 1943 | 1943 | 1943 | 1943 | 1943 |
| Total Crop | 17932 | 21681 | 25597 | 24201 | 13863 |
| Livestock | | | | | |
| Bulls | 2000 | 2000 | 1000 | 1000 | 2000 |
| Cows | 19355 | 16726 | 14098 | 11708 | 18160 |
| Bred Heifers | 3743 | 3119 | 2496 | 1872 | 3743 |
| Repl Heifers | 2289 | 1907 | 1526 | 1144 | 2289 |
| Steer Calves | 8177 | 7316 | 6025 | 4734 | 7746 |
| Heifer Calves | 5341 | 4578 | 3815 | 3433 | 4959 |
| Total Livestock | 40905 | 35646 | 28960 | 23891 | 38897 |
| TOTAL CURRENT ASSETS | 20148 | 10094 | -9873 | -15959 | 20714 |
| FIXED ASSETS | | | | | |
| Land | | | | | |
| Deeded Pasture Land | 0 | 0 | 0 | 0 | 159300 |
| Improved Pasture | 87500 | 87500 | 87500 | 87500 | 65800 |
| Crop land | 196000 | 196000 | 19600 | 19600 | 196300 |
| Native Hay Land | 46800 | 46800 | 46800 | 46800 | 46800 |
| Grass-Legume Hay Land | 22500 | 22500 | 22500 | 22500 | 22500 |
| Total Land | 352800 | 352800 | 352800 | 352800 | 490400 |

**TABLE VI.3: Continued**

| | Full lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| Total Buildings | 12338 | 12338 | 12338 | 12338 | 14453 |
| Total Machinery | 79826 | 79826 | 79826 | 79826 | 79826 |
| TOTAL FIXED ASSETS | 444964 | 444964 | 444964 | 444964 | 584679 |
| Other Assets | 10438 | 10285 | 10931 | 10847 | 12025 |
| TOTAL ASSETS | 475550 | 465343 | 446022 | 439852 | 617418 |
| Liabilities | 2254 | 2627 | 3450 | 3329 | 1900 |
| Beginning Equity | 483981 | 474964 | 455390 | 451566 | 626771 |
| Total Net Income | 4030 | 2467 | 1897 | -328 | 3462 |
| Living Expenses | 14715 | 14715 | 14715 | 14715 | 14715 |
| Income Tax | 0 | 0 | 0 | 0 | 0 |
| Equity | -10685 | -12248 | -12818 | -15043 | -11253 |
| Ending Equity | 473296 | 462716 | 442572 | 436523 | 615518 |
| Equity Change(%) | -2.2 | -2.6 | -2.8 | -3.3 | -1.8 |

capital.

Liabilities increase from the full lease to the lease removed operations. The non-lease using operation shows the lowest liability levels.

Equity declines yearly for all of the northern small operations, and shows further decreases as lease land is reduced. The non lease using operation is in the highest equity position.

Table VI.4 shows the capital structure of the central large operations. Assets decline slightly as lease land is removed. Fixed assets show a very slight decrease with reduction of lease land, while current assets show a more substantial decline. The non lease using operation showed the lowest level of assets, both fixed and current.

Liabilities were zero for all operations, as operating capital was sufficient to cover operating costs. Equity levels declined as the use of lease land was reduced. The lowest equity level was shown in the non lease using operation.

Table VI.5 shows the capital structure of the central mid-size operations. Total assets decline as lease land is reduced. While fixed assets decline only slightly, current assets show a more substantial decline. Fixed assets in the non lease using operation are similar in value to the lease using operations, while current assets are much less in value.

Liabilities are only shown in the '1/3 lease' and 'non lease using' operations. Equity decreases as lease is removed, and the non lease using operation shows the lowest equity.

Table VI.6 shows the capital structure of the central small operation. Total assets decline as lease is removed, and the lowest total assets value is shown for the non lease using operation.

Fixed assets decline when lease is reduced to 2/3, and then remain stable for the lease using operations. Fixed assets are lower in the non lease using operations. Total current assets show a sharp decline as lease is removed, becoming negative when the 1/3 lease point is reached. This is due to a lack of operating capital in all central small operations.

## Table VI.4: FARM BUSINESS SUMMARY FOR CENTRAL LARGE OPERATIONS

Farm Statement at End of Fifth Year

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| ASSETS | | | | | |
| CURRENT ASSETS | | | | | |
| Cash | 205727 | 202049 | 199242 | 194292 | 75811 |
| Crops | | | | | |
| Mixed Hay | 71897 | 69225 | 63027 | 55888 | 79357 |
| Barley | 8805 | 8792 | 8774 | 8757 | 8708 |
| Oilseed | 4122 | 4122 | 4122 | 4122 | 4122 |
| Total Crop | 84824 | 82139 | 75923 | 68767 | 92187 |
| Livestock | | | | | |
| Bulls | 6000 | 5000 | 5000 | 5000 | 5000 |
| Cows | 61170 | 59498 | 57586 | 55914 | 50418 |
| Bred Heifers | 12478 | 12478 | 11854 | 11230 | 10606 |
| Repl Heifers | 7630 | 7630 | 7248 | 6867 | 6485 |
| Steer Calves | 26251 | 25821 | 24960 | 24100 | 21517 |
| Heifer Calves | 16022 | 15259 | 14878 | 14496 | 12970 |
| Total Livestock | 129551 | 125686 | 121526 | 117607 | 106996 |
| TOTAL CURRENT ASSETS | 420102 | 409874 | 396691 | 38066 | 274994 |
| FIXED ASSETS | | | | | |
| Land | | | | | |
| Deeded Pasture | 28000 | 28000 | 28000 | 28000 | 28000 |
| Improved Pasture | 80400 | 80400 | 80400 | 80400 | 44000 |
| Crop Land | 300300 | 300300 | 300300 | 300300 | 300300 |
| Native Hay | 156000 | 156000 | 156000 | 156000 | 156000 |
| Grass-Legume Hay | 60000 | 60000 | 60000 | 60000 | 60000 |
| Total Land | 624700 | 624700 | 624700 | 624700 | 709050 |

**Table VI.4: Continued**

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| Total Buildings | 63066 | 52986 | 52386 | 51906 | 34299 |
| Total Machinery | 115850 | 115850 | 115850 | 115850 | 115850 |
| TOTAL FIXED ASSETS | 803616 | 793536 | 792936 | 792456 | 859199 |
| Other Assets | 0 | 0 | 0 | 0 | 0 |
| TOTAL ASSETS | 1223718 | 1203410 | 1189627 | 1173122 | 1134193 |
| Liabilities | 0 | 0 | 0 | 0 | 0 |
| Beginning Equity | 1203480 | 1192505 | 1182870 | 1169545 | 1129436 |
| Total Net Income | 42619 | 39677 | 38364 | 36875 | 26712 |
| Living Expenses | 15577 | 15481 | 15386 | 15265 | 15131 |
| Income Tax | 6804 | 5331 | 4719 | 4287 | 544 |
| Equity | 20238 | 18865 | 18259 | 17323 | 11037 |
| Ending Equity | 1223718 | 1207390 | 1195378 | 1179995 | 1137333 |
| Equity Change(%) | 1.68 | 1.25 | 1.06 | .89 | .70 |

**Table VI.5: FARM BUSINESS SUMMARY FOR CENTRAL MIDSIZE OPERATIONS**

Farm Statement at End of Fifth Year

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| ASSETS | | | | | |
| CURRENT ASSETS | | | | | |
| Cash | 42446 | 43174 | 27930 | 28447 | 31392 |
| Crops | | | | | |
| Mixed Hay | 6993 | 6734 | 5864 | 5136 | 6429 |
| Barley | 7433 | 7405 | 7275 | 7210 | 7621 |
| Oilseed | 3621 | 3621 | 3621 | 3621 | 3621 |
| Total Crop | 18047 | 17760 | 16760 | 15967 | 17671 |
| Livestock | | | | | |
| Bulls | 3000 | 3000 | 3000 | 3000 | 2000 |
| Cows | 32975 | 32497 | 32258 | 31302 | 26762 |
| Bred Heifers | 6863 | 6863 | 6239 | 6239 | 5615 |
| Repl Heifers | 4196 | 4196 | 3815 | 3815 | 3433 |
| Steer Calves | 14202 | 14202 | 14202 | 13771 | 11619 |
| Heifer Calves | 8393 | 8393 | 8774 | 8393 | 7248 |
| Total Livestock | 69629 | 69151 | 68288 | 66520 | 56677 |
| TOTAL CURRENT ASSETS | 130122 | 130085 | 112978 | 110934 | 105740 |
| FIXED ASSETS | | | | | |
| Land | | | | | |
| Deeded Pasture | 96250 | 96250 | 96250 | 96250 | 100650 |
| Improved Pasture | 117000 | 117000 | 117000 | 117000 | 112200 |
| Crop Land | 338000 | 338000 | 338000 | 338000 | 338000 |
| Native Hay | 47600 | 47600 | 47600 | 47600 | 47600 |
| Grass-Legume Hay | 28000 | 28000 | 28000 | 28000 | 28000 |
| Total Land | 626850 | 626850 | 626850 | 626850 | 626450 |

**TABLE VI.5: Continued**

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| Total Buildings | 28961 | 28841 | 28721 | 2812 | 28980 |
| Total Machinery | 101810 | 101810 | 101810 | 101810 | 101810 |
| TOTAL FIXED ASSETS | 757621 | 757501 | 757381 | 756789 | 757240 |
| Other Assets | 3881 | 3995 | 3643 | 7938 | 2849 |
| TOTAL ASSETS | 891624 | 891581 | 874002 | 867723 | 865829 |
| Liabilities | 0 | 175 | 0 | 0 | 37 |
| Beggining Equity | 887348 | 887129 | 870589 | 870302 | 866171 |
| Total Net Income | 18991 | 19167 | 17953 | 20074 | 14336 |
| Living Expenses | 14715 | 14715 | 14715 | 14715 | 14715 |
| Income Tax | 0 | 0 | 0 | 0 | 0 |
| Addition to Equity | 4276 | 4452 | 3238 | 5359 | -379 |
| Ending Equity | 891624 | 891581 | 873827 | 875661 | 865792 |
| Equity Change(%) | .48 | .50 | .37 | .62 | -.04 |

## Table VI.6: FARM BUSINESS SUMMARY FOR CENTRAL SMALL OPERATIONS

Farm Statement at End of Fifth Year

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| ASSETS | | | | | |
| CURRENT ASSETS | | | | | |
| Cash | -45654 | -48005 | -55238 | -62369 | -44997 |
| Crops | | | | | |
| Mixed Hay | 5117 | 4458 | 4197 | 4740 | 25071 |
| Barley | 2140 | 1906 | 1870 | 1676 | 2236 |
| Oilseed | 1056 | 1056 | 1056 | 1056 | 1056 |
| Total Crop | 8313 | 7420 | 7123 | 7472 | 363 |
| Livestock | | | | | |
| Bulls | 2000 | 2000 | 2000 | 2000 | 1000 |
| Cows | 22222 | 21505 | 20311 | 19355 | 10036 |
| Bred Heifers | 4367 | 4367 | 3743 | 3743 | 1872 |
| Repl. Heifers | 2670 | 2670 | 2289 | 2289 | 1144 |
| Steer Calves | 9468 | 9468 | 8607 | 8177 | 4303 |
| Heifer Calves | 6104 | 5722 | 5722 | 5341 | 2670 |
| Total Livestock | 46831 | 45732 | 42672 | 40905 | 21025 |
| TOTAL CURRENT ASSETS | 9490 | 5147 | -5443 | -13992 | 4391 |
| FIXED ASSETS | | | | | |
| Land | | | | | |
| Deeded Pasture | 166000 | 166000 | 166000 | 166000 | 35200 |
| Improved Pasture | 0 | 0 | 0 | 0 | 36900 |
| Crop Land | 75000 | 75000 | 75000 | 75000 | 75000 |
| Natural Hay Land | 31500 | 31500 | 31500 | 31500 | 31500 |
| Grass-Legume Hay Land | 32500 | 32500 | 32500 | 32500 | 32500 |
| Total Land | 305000 | 305000 | 305000 | 305000 | 211100 |

**TABLE VI.6: Continued**

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| Total Buildings | 27900 | 17325 | 17325 | 17325 | 17325 |
| Total Machinery | 54619 | 54619 | 54619 | 54619 | 54619 |
| TOTAL FIXED ASSETS | 387519 | 376944 | 376944 | 376944 | 283044 |
| Other Assets | 2660 | 13283 | 13851 | 13991 | 7359 |
| TOTAL ASSETS | 399669 | 395374 | 385352 | 376943 | 294794 |
| Liabilities | 2571 | 2652 | 2954 | 3250 | 2092 |
| Beginning Equity | 405016 | 401248 | 392332 | 385356 | 309161 |
| Total Net Income | 6797 | 6189 | 4781 | 3052 | -1744 |
| Living Expenses | 14715 | 14715 | 14715 | 14715 | 14715 |
| Income Tax | 0 | 0 | 0 | 0 | 0 |
| Equity Addition | -7918 | -8526 | -9934 | -11663 | -16459 |
| Ending Equity | 397098 | 392722 | 382398 | 373693 | 292702 |
| Equity Change(%) | -2.0 | -2.12 | -2.5 | -3.0 | -5.3 |

Lack of operating capital promotes borrowing of short term capital, and liabilities increase as less lease land is used. The lowest liability value is shown for the non lease using operation. Equity levels decline as less lease land is utilized, and the least equity is shown in the non lease using operation.

Table VI.7 shows the capital structure of the southern large operations. Total assets again decline as lease land quantities are reduced. Fixed assets decrease somewhat, while current assets decline more substantially. Total fixed assets show less value in the non lease using operation.

Liabilities were present in the 1/3 lease and lease removed operations. Equity declined as less lease land was used, and the lowest equity was shown in the non lease using operation.

Table VI.8 shows the capital structure for the southern mid-size operations. Again, total assets decline as less lease land is utilized. Fixed assets remain stable throughout the lease using operations, and current assets decline as less lease land is utilized.

Liabilities are only existent in the non lease using operation. Equity shows a decline as less lease land is used, the lowest equity is in the non lease using operation.

Table VI.9 shows the capital structure of the southern small operations. Total fixed assets decline as less lease land is used. The portion composed of fixed assets remains stable, while current assets show substantial declines. Cash flow is severely restricted as operating capital is virtually non existent.

Liabilities for short term capital are shown in all operations. Equity levels decline as less lease land is utilized, the non lease using operation shows a mid range equity level when compared with the other southern small operations.

A general trend is noted in examining the statements of assets, liabilities and equity of the farm simulations. In every operation, the reduction of lease holdings resulted in a reduction of current assets and equity. In some cases fixed asset values were reduced as well. The reduction in current assets translated into cash flow problems for most of the operations.

**Table VI.7: FARM BUSINESS SUMMARY FOR SOUTHERN LARGE OPERATIONS**

Farm Statement at End of Fifth Year

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| ASSETS | | | | | |
| CURRENT ASSETS | | | | | |
| Cash | 243656 | 237574 | 200377 | 145247 | 242626 |
| Crops | | | | | |
| Mixed Hay | 17108 | 52274 | 95372 | 113573 | 46437 |
| Barley | 11197 | 10139 | 9916 | 9689 | 9800 |
| Oilseed | 0 | 0 | 0 | 0 | 0 |
| Total Crop | 28305 | 62413 | 105288 | 123262 | 56237 |
| Livestock | | | | | |
| Bulls | 11000 | 9000 | 7000 | 5000 | 6000 |
| Cows | 123058 | 97968 | 73835 | 49701 | 61648 |
| Bred Heifers | 25580 | 20589 | 15597 | 9982 | 12478 |
| Repl. Heifers | 15612 | 12560 | 9508 | 6104 | 7630 |
| Steer Calves | 53263 | 42504 | 32176 | 21517 | 26682 |
| Heifer Calves | 31985 | 25119 | 19015 | 12970 | 16022 |
| Total Livestock | 260498 | 207740 | 157131 | 105274 | 130460 |
| TOTAL CURRENT ASSETS | 532459 | 507727 | 462796 | 373783 | 429323 |
| FIXED ASSETS | | | | | |
| Land | | | | | |
| Deeded Pasture | 1365599 | 1365599 | 1365599 | 1365599 | 360000 |
| Improved Pasture | 14850 | 14850 | 14850 | 14850 | 0 |
| Crop Land | 412500 | 412500 | 412500 | 412500 | 412500 |
| Natural Hay Land | 0 | 0 | 0 | 0 | 0 |
| Grass-Legume Hay Land | 233000 | 233000 | 233000 | 233000 | 233000 |
| Total Land | 2025949 | 2025949 | 2025949 | 2025949 | 1005500 |

**Table VI.7: Continued**

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| Total Buildings | 35497 | 32725 | 32725 | 32725 | 32725 |
| Total Machinery | 110158 | 87616 | 87516 | 87516 | 91416 |
| TOTAL FIXED ASSETS | 2171604 | 2146190 | 2146190 | 2146190 | 1129641 |
| Other Assets | 5097 | 5072 | 0 | 0 | 5550 |
| TOTAL ASSETS | 2709160 | 2658989 | 2608986 | 2519973 | 1564514 |
| Liabilities | 0 | 0 | 4670 | 9470 | 0 |
| Beginning Equity | 2656722 | 2629073 | 2582756 | 2500119 | 1543265 |
| Total Net Income | 77514 | 65170 | 47602 | 27311 | 45739 |
| Living Expenses | 16681 | 16023 | 16096 | 15760 | 15541 |
| Income Tax | 8395 | 19231 | 9946 | 1171 | 8949 |
| Equity Addition | 524385 | 29916 | 21560 | 10380 | 21249 |
| Ending Equity | 2709160 | 2658989 | 2604316 | 2510499 | 1564514 |
| Equity Change(%) | 2.0 | 1.14 | .83 | .42 | 1.38 |

**Table VI.8: FARM BUSINESS SUMMARY FOR SOUTHERN MIDSIZE OPERATIONS**

Farm Statement at End of Fifth Year

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| ASSETS | | | | | |
| CURRENT ASSETS | | | | | |
| Cash | 68484 | 62766 | 59841 | 53310 | 7666 |
| Crops | | | | | |
| Mixed Hay | 15008 | 16270 | 15730 | 16251 | 16560 |
| Barley | 2297 | 2343 | 2391 | 2429 | 2372 |
| Oilseed | 957 | 957 | 957 | 957 | 957 |
| Total Crop | 18262 | 19570 | 19078 | 19637 | 19889 |
| Livestock | | | | | |
| Bulls | 4000 | 4000 | 4000 | 3000 | 40000 |
| Cows | 44683 | 42772 | 40382 | 38471 | 41338 |
| Bred Heifers | 9358 | 8735 | 8111 | 7487 | 8111 |
| Repl. Heifers | 5722 | 5341 | 4959 | 4578 | 4959 |
| Steer Calves | 19366 | 18075 | 17214 | 16353 | 17644 |
| Heifer Calves | 11444 | 11063 | 10300 | 9919 | 10681 |
| Total Livestock | 94573 | 89986 | 84966 | 79808 | 86733 |
| TOTAL CURRENT ASSETS | 181319 | 172322 | 163885 | 152755 | 114288 |
| FIXED ASSETS | | | | | |
| Land | | | | | |
| Deeded Pasture | 27900 | 27900 | 27900 | 27900 | 78300 |
| Improved Pasture | 64050 | 64050 | 64050 | 64050 | 39550 |
| Crop Land | 84600 | 84600 | 84600 | 84600 | 84600 |
| Natural Hay Land | 0 | 0 | 0 | 0 | 0 |
| Grass-Legume Hay Land | 77600 | 77600 | 77600 | 77600 | 77600 |
| Total Land | 254150 | 254150 | 254150 | 254150 | 280050 |

**TABLE VI.8: Continued**

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| Total Buildings | 29037 | 29037 | 29037 | 29037 | 23678 |
| Total Machinery | 70686 | 70686 | 70686 | 70686 | 70686 |
| TOTAL FIXED ASSETS | 353873 | 353873 | 353873 | 353873 | 374414 |
| Other Assets | 12453 | 12090 | 10915 | 10915 | 11268 |
| TOTAL ASSETS | 547645 | 538285 | 528673 | 517543 | 499970 |
| Liabilities | 0 | 0 | 0 | 0 | 712 |
| Beginning Equity | 536424 | 528242 | 519436 | 509611 | 493177 |
| Total Net Income | 28680 | 29428 | 25676 | 23837 | 21040 |
| Living Expenses | 14726 | 14715 | 14715 | 14715 | 14715 |
| Income Tax | 2733 | 2167 | 1724 | 1190 | 244 |
| Additions To Equity | 11221 | 12526 | 9237 | 7932 | 6081 |
| Ending Equity | 547645 | 540788 | 528673 | 517543 | 499258 |
| Equity Change(%) | 2.09 | 2.4 | 1.78 | 1.56 | 1.23 |

**Table VI.9: FARM BUSINESS SUMMARY FOR SOUTHERN SMALL OPERATIONS**

Farm Statement at End of Fifth Year

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| ASSETS | | | | | |
| CURRENT ASSETS | | | | | |
| Cash | -4402 | -3729 | -8313 | -5939 | -3271 |
| Crops | | | | | |
| Mixed Hay | 18466 | 19271 | 19879 | 19703 | 19361 |
| Barley | 5254 | 5240 | 5277 | 5217 | 5222 |
| Oilseed | 2293 | 2293 | 2293 | 2293 | 2293 |
| Total Crop | 26013 | 26804 | 27399 | 27213 | 26876 |
| Livestock | | | | | |
| Bulls | 2000 | 1000 | 1000 | 1000 | 1000 |
| Cows | 17921 | 16248 | 14815 | 13859 | 14576 |
| Bred Heifers | 3119 | 3119 | 3119 | 2496 | 2496 |
| Repl. Heifers | 1907 | 1907 | 1907 | 1526 | 1526 |
| Steer Calves | 7746 | 6886 | 6455 | 6025 | 6025 |
| Heifer Calves | 4959 | 4578 | 3815 | 3815 | 4196 |
| Total Livestock | 37652 | 33738 | 31111 | 28721 | 29819 |
| TOTAL CURRENT ASSETS | 59263 | 56813 | 50197 | 49995 | 53424 |
| FIXED ASSETS | | | | | |
| Land | | | | | |
| Deeded Pasture | 136000 | 136000 | 136000 | 136000 | 136000 |
| Improved Pasture | 123750 | 123750 | 123750 | 123750 | 123750 |
| Crop Land | 253500 | 253500 | 253500 | 253500 | 253500 |
| Natural Hay Land | 0 | 0 | 0 | 0 | 0 |
| Grass-Legume Hay Land | 51000 | 51000 | 51000 | 51000 | 51000 |
| Total Land | 564250 | 564250 | 564250 | 564250 | 564250 |

**TABLE VI.9: Continued**

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| Total Buildings | 39224 | 39224 | 39224 | 39224 | 39224 |
| Total Machinery | 66084 | 66084 | 66084 | 66084 | 66084 |
| TOTAL FIXED ASSETS | 669558 | 669558 | 669558 | 669558 | 669558 |
| Other Assets | 8450 | 8033 | 8096 | 7841 | 7742 |
| TOTAL ASSETS | 737271 | 734404 | 727851 | 727394 | 730724 |
| Liabilities | 352 | 300 | 444 | 358 | 275 |
| Beginning Equity | 747595 | 744399 | 738797 | 737753 | 740738 |
| Total Net Income | 4039 | 4420 | 3325 | 3998 | 4426 |
| Living Expenses | 14715 | 14715 | 14715 | 14715 | 14715 |
| Income Tax | 0 | 0 | 0 | 0 | 0 |
| Additions To Equity | -10676 | -10295 | -11390 | -10717 | 10289 |
| Ending Equity | 736919 | 734104 | 727407 | 727036 | 730449 |
| Equity Change(%) | -1.4 | -1.4 | -1.5 | -1.5 | -1.4 |

### C. Net Farm Income Analysis

Net farm incomes for each simulation are presented in Tables VI.10 through VI.18. Some general trends exist in net farm incomes. Trends can be noted also in the simulated lease land component adjustments.

Large operations tended to have higher net incomes than mid-size operations, and small operations displayed the lowest net incomes. Net income analysis to examine these trends is presented in Tables VI.19, VI.20, and VI.21. In large operations net farm income was greatest in the southern region, followed by the northern region, and then the central region. In medium sized operations net farm income was greatest to least in southern, then central and northern regions. Small size operations showed net incomes from greatest to least in central, southern and then northern regions. Each size of operation and region was examined to determine the effects of decreasing lease pasture land on the net farm income. Each simulation where lease pasture acreages were reduced is compared with the original representative operation with lease, as is the original representative operation containing no lease.

#### Northern Operations

The change in net income resulting from decreases in lease pasture acreage was most pronounced in the northern small operations. In this representative operation, 76% of the pasture land base was supplied by lease lands. Decreasing lease pasture by 1/3 decreased net income by 39%,[61] decreasing lease pasture by 2/3 decreased net income by 53%, and removing the lease component entirely resulted in a 108% decrease in income (i.e. a negative net income was shown). In comparing the lease operation originally containing no lease with that of full lease, a lesser net income by 14% was noted. Lesser net incomes in lease simulations can be attributed in part to capital fixity in the original lease utilizing operation.

By decreasing gradually the quantity of lease land available in operations ( i.e. full lease, 2/3 lease, 1/3 lease, and finally no lease), a situation where an operator is accustomed to

---

[61]Percentage changes are calculated in the following manner:
Decrease in net income x 100 / net income with full lease = percentage change.

**Table VI.10: NET INCOME SUMMARY FOR NORTHERN LARGE OPERATIONS**

Farm Statement at End of Fifth Year

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| REVENUE | | | | | |
| Cattle Receipts | 131274 | 111971 | 93132 | 73969 | 117799 |
| Crop Receipts | 12121 | 13808 | 15479 | 17231 | 13250 |
| Other Receipts[1] | 2799 | 1373 | 0 | 0 | 8683 |
| Total Revenue | 146194 | 127152 | 108611 | 91200 | 139732 |
| EXPENSES | | | | | |
| Cattle Expenses | 23048 | 19785 | 15861 | 12882 | 19562 |
| Crop Expenses | 37111 | 37014 | 36944 | 36647 | 37052 |
| Wages and Salaries | 30226 | 27790 | 25634 | 23151 | 27973 |
| Total Expenses | 90280 | 84599 | 78424 | 72680 | 84533 |
| TOTAL NET INCOME | 55914 | 42554 | 30187 | 18520 | 55199 |

[1]Composed primarily of interest on cash assets.

**Table VI.11: NET INCOME SUMMARY FOR NORTHERN MIDSIZE OPERATIONS**

Farm Statement at End of Fifth Year

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| REVENUE | | | | | |
| Cattle Receipts | 49780 | 44045 | 38142 | 31120 | 39338 |
| Crop Receipts | 24789 | 25287 | 25745 | 26231 | 25659 |
| Other Receipts[1] | 1981 | 1285 | 525 | 0 | 3504 |
| Total Revenue | 76550 | 70617 | 64412 | 57351 | 68501 |
| EXPENSES | | | | | |
| Cattle Expenses | 9592 | 8643 | 7740 | 6787 | 8221 |
| Crop Expenses | 33584 | 33387 | 33489 | 33273 | 33526 |
| Wages and Salaries | 13524 | 12674 | 12386 | 12191 | 12416 |
| Total Expenses | 56683 | 54693 | 53610 | 52251 | 54163 |
| TOTAL NET INCOME | 19867 | 15924 | 10802 | 5100 | 14338 |

[1]Composed primarily of interest on cash assets

**Table VI.12: NET INCOME SUMMARY FOR NORTHERN SMALL OPERATIONS**

Farm Statement at End of Fifth Year

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| REVENUE | | | | | |
| Cattle Receipts | 21141 | 18826 | 16434 | 13477 | 19946 |
| Crop Receipts | 11007 | 11241 | 11505 | 11735 | 11101 |
| Other Receipts[1] | 0 | 0 | 0 | 0 | 0 |
| Total Revenue | 32148 | 30067 | 27939 | 25212 | 31047 |
| EXPENSES | | | | | |
| Cattle Expenses | 4771 | 4337 | 2871 | 2446 | 4276 |
| Crop Expenses | 13507 | 13423 | 13331 | 13254 | 13469 |
| Wages and Salaries | 9840 | 9840 | 9840 | 9840 | 9840 |
| Total Expenses | 28118 | 27600 | 26042 | 25540 | 27585 |
| TOTAL NET INCOME | 4030 | 2467 | 1897 | -328 | 3462 |

[1]Composed primarily of interest on cash assets.

**Table VI.13: NET INCOME SUMMARY FOR CENTRAL LARGE OPERATIONS**

Farm Statement at End of Fifth Year

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| REVENUE | | | | | |
| Cattle Receipts | 69815 | 68067 | 65752 | 63436 | 57445 |
| Crop Receipts | 10571 | 10706 | 10892 | 11069 | 11564 |
| Other Receipts[1] | 8369 | 8190 | 8084 | 7871 | 2233 |
| Total Revenue | 88755 | 86963 | 84728 | 82376 | 71242 |
| EXPENSES | | | | | |
| Cattle Expenses | 11469 | 10001 | 9519 | 9057 | 7618 |
| Crop Expenses | 20181 | 20105 | 20024 | 19951 | 19722 |
| Wages and Salaries | 14486 | 17180 | 16821 | 16493 | 17190 |
| Total Expenses | 46136 | 47286 | 46364 | 45501 | 45530 |
| TOTAL NET INCOME | 42619 | 39677 | 38364 | 36875 | 26712 |

[1]Composed primarily of interest on cash assets.

**Table VI.14: NET INCOME SUMMARY FOR CENTRAL MIDSIZE OPERATIONS**

Farm Statement at End of Fifth Year

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| REVENUE | | | | | |
| Cattle Receipts | 37499 | 37499 | 37023 | 35827 | 30478 |
| Crop Receipts | 10951 | 10921 | 10759 | 10763 | 11816 |
| Other Receipts[1] | 1045 | 1077 | 371 | 917 | 709 |
| Total Revenue | 49495 | 49497 | 48153 | 47507 | 43003 |
| EXPENSES | | | | | |
| Cattle Expenses | 6473 | 6329 | 6193 | 5962 | 5323 |
| Crop Expenses | 13769 | 13763 | 13799 | 11377 | 13430 |
| Wages and Salaries | 10266 | 10240 | 10208 | 10094 | 9914 |
| Total Expenses | 30504 | 30330 | 31200 | 27433 | 28667 |
| TOTAL NET INCOME | 18991 | 19167 | 17953 | 20074 | 14336 |

[1]Composed primarily of interest on cash assets.

**Table VI.15: NET INCOME SUMMARY FOR CENTRAL SMALL OPERATIONS**

Farm Statement at End of Fifth Year

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| **REVENUE** | | | | | |
| Cattle Receipts | 24652 | 24099 | 22337 | 21141 | 11728 |
| Crop Receipts | 1821 | 1536 | 1532 | 1106 | 3253 |
| Other Receipts[1] | 0 | 0 | 0 | 0 | 0 |
| Total Revenue | 26473 | 25635 | 23869 | 22248 | 14982 |
| **EXPENSES** | | | | | |
| Cattle Expenses | 4844 | 4609 | 4264 | 4387 | 2059 |
| Crop Expenses | 4974 | 4982 | 4973 | 4960 | 4826 |
| Wages and Salaries | 9858 | 9855 | 9851 | 9848 | 9840 |
| Total Expenses | 19676 | 19447 | 19088 | 19195 | 16725 |
| TOTAL NET INCOME | 6797 | 6189 | 4781 | 3052 | -1744 |

[1]Composed primarily of interest on cash assets.

**Table VI.16: NET INCOME SUMMARY FOR SOUTHERN LARGE OPERATIONS**

Farm Statement at End of Fifth Year

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| REVENUE | | | | | |
| Cattle Receipts | 141254 | 112449 | 84363 | 56968 | 70458 |
| Crop Receipts | 843 | 5533 | 7608 | 9741 | 8707 |
| Other Receipts[1] | 9025 | 9536 | 8026 | 5691 | 10171 |
| Total Revenue | 151122 | 127122 | 99997 | 72400 | 89336 |
| EXPENSES | | | | | |
| Cattle Expenses | 31930 | 25430 | 18508 | 11960 | 11167 |
| Crop Expenses | 17775 | 18661 | 18353 | 18047 | 18195 |
| Wages and Salaries | 23903 | 18257 | 15534 | 15082 | 14235 |
| Total Expenses | 73608 | 62348 | 52395 | 45089 | 43597 |
| TOTAL NET INCOME | 77514 | 65170 | 47602 | 27311 | 45739 |

[1]Composed primarily of interest on cash assets.

## Table VI.17: NET INCOME SUMMARY FOR SOUTHERN MIDSIZE OPERATIONS

Farm Statement at End of Fifth Year

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| REVENUE | | | | | |
| Cattle Receipts | 51066 | 49228 | 46359 | 44045 | 47555 |
| Crop Receipts | 5224 | 6288 | 4502 | 3981 | 1002 |
| Other Receipts[1] | 1913 | 2264 | 1582 | 1327 | 0 |
| Total Revenue | 58204 | 57780 | 52443 | 49352 | 48557 |
| EXPENSES | | | | | |
| Cattle Expenses | 10374 | 9601 | 8444 | 7561 | 7865 |
| Crop Expenses | 5524 | 5504 | 5482 | 5464 | 5491 |
| Wages and Salaries | 13625 | 13247 | 12841 | 12491 | 14161 |
| Total Expenses | 29523 | 28352 | 26767 | 25516 | 27516 |
| TOTAL NET INCOME | 28681 | 29428 | 25676 | 23836 | 21041 |

[1]Composed primarily of interest on cash assets.

**Table VI.18: NET INCOME SUMMARY FOR SOUTHERN SMALL OPERATIONS**

Farm Statement at End of Fifth Year

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| REVENUE | | | | | |
| Cattle Receipts | 19469 | 18183 | 16434 | 16434 | 16987 |
| Crop Receipts | 8608 | 8736 | 8856 | 8950 | 8905 |
| Other Receipts[1] | 0 | 0 | 0 | 0 | 0 |
| Total Revenue | 28077 | 26919 | 25290 | 25384 | 25892 |
| EXPENSES | | | | | |
| Cattle Expenses | 6979 | 5410 | 4876 | 4389 | 4444 |
| Crop Expenses | 7219 | 7249 | 7249 | 7157 | 7182 |
| Wages and Salaries | 9840 | 9840 | 9840 | 9840 | 9840 |
| Total Expenses | 24038 | 22499 | 21965 | 21386 | 21466 |
| TOTAL NET INCOME | 4039 | 4420 | 3325 | 3998 | 4426 |

[1]Composed primarily of interest on cash assets.

the use of lease land, and then is deprived of it is simulated. Large amounts of capital in the form of fixed assets may remain 'non-liquid', even though throughput capacity is reduced. Even in the northern small operations where total assets are relatively low in value ($475,550), fixed assets composes $444,964 of this amount. For example, a northern operation is modelled to possess sheds which provide maximum shelter at a high capital cost. Once the quantity of lease land is decreased, and herd size is subsequently diminished, the buildings in existence when herd size was larger still exist, but are now underutilized. Investment alternatives are thus restricted due to asset fixity.

An operator who has never possessed lease land would have an operation containing different quantities of pasture land, and somewhat different herd sizes ceteris paribus. Production strategies for both the original lease and non-lease operations were specified as identical, yet capabilities to carry out these strategies differ with differing inputs. Thus some difference in income can be expected. Nonetheless, a lower net income from representative operations without lease indicates a lower income earning capability than operations with lease land. The magnitude of this lower capacity must be observed taking the above discussion into account.

The stepwise removal of lease pasture next greatly affected the midsize operations. The portion of pastureland in this operation represented by lease land was 57.5%. Decreasing lease pasture by 1/3 reduced net income by 20%, decreasing lease pasture by 2/3 reduced net income by 46%, and removing the lease component altogether reduced net income by 74%. The difference in income between the original operation with lease and the original operation with no lease was 28%.

The large operations averaged a decrease in net income of 45.3% when lease pasture was decreased. Decreasing lease pasture by 1/3 reduced net income by 24% and decreasing lease pasture by 2/3 reduced net income by 46%. Removing the lease component altogether reduced net income by 66%. Only a 1% lower income was shown in the original operation utilizing no lease land when compared with the income for the original operation using lease.

Table VI.19: NET INCOME ANALYSIS - NORTHERN REGION

| | PASTURE ACREAGES | | | | CATTLE SALES (HEAD) | | | INCOME ANALYSIS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LEASE STATUS | DEEDED NATIVE | DEEDED IMPROVED | LEASED NATIVE | LEASED IMPROVED | CULL COWS | FEEDER STEERS | FEEDER HEIFERS | INCOME | INCOME DECREASE | PERCENT CHANGE | AVERAGE CHANGE |
| **SMALL** | | | | | | | | | | | |
| FULL | 0 | 250 | 800 | 0 | 5 | 18 | 13 | 4,030 | | | |
| 2/3 | 0 | 250 | 528 | 0 | 4 | 16 | 12 | 2,467 | 1,563 | 39 | |
| 1/3 | 0 | 250 | 264 | 0 | 4 | 14 | 10 | 1,897 | 2,133 | 53 | 66.67 |
| Removed | 0 | 250 | 0 | 0 | 3 | 11 | 9 | -328 | 4,358 | 108 | |
| None | 531 | 188 | 0 | 0 | 5 | 17 | 12 | 3,462 | 568 | 14 | |
| **MID SIZE** | | | | | | | | | | | |
| FULL | 603 | 493 | 1433 | 50 | 13 | 42 | 30 | 19,867 | | | |
| 2/3 | 603 | 493 | 946 | 33 | 11 | 38 | 26 | 15,924 | 3,943 | 20 | |
| 1/3 | 603 | 493 | 473 | 17 | 10 | 33 | 22 | 10,802 | 9,065 | 46 | 53.5 |
| Removed | 603 | 493 | 0 | 0 | 8 | 27 | 18 | 5,100 | 14,767 | 74 | |
| None | 350 | 260 | 0 | 0 | 10 | 34 | 23 | 14,338 | 5,529 | 28 | |
| **LARGE** | | | | | | | | | | | |
| FULL | 1558 | 328 | 4552 | 219 | 34 | 113 | 77 | 55,914 | | | |
| 2/3 | 1558 | 328 | 3004 | 145 | 29 | 97 | 65 | 42,553 | 13,361 | 24 | |
| 1/3 | 1558 | 328 | 1502 | 72 | 24 | 80 | 55 | 30,187 | 25,727 | 46 | 45.3 |
| Removed | 1558 | 328 | 0 | 0 | 19 | 64 | 43 | 18,520 | 37,394 | 66 | |
| None | 1264 | 304 | 0 | 0 | 31 | 102 | 68 | 55,199 | 715 | 1 | |

**Central Operations**

The central operations were unique in their responses to lease pasture decreases, which can be attributed to distinct lease pasture utilization trends. The lowest overall utilization of lease land is shown in these operations. This reflects the actual trend of acreage of lease land available for use in these regions. As such, dependence on lease land was less in these regions, and expectedly, decrease in net income attributable to lease removal was less. (The only exception to this trend exists in southern small operations where even less reduction in net income is realized from reductions in lease pasture).

The central small-size operation with lease utilized 35% of overall pasture acreages as lease. The average reduction in net income due to decreasing lease pasture was 31.3%. Decreasing lease pasture by 1/3 reduced net income by 9%, decreasing lease pasture by 2/3 reduced net income by 30% and removing all lease pasture acreage reduced net income by 55%. The representative operation with no lease showed a net income of 126% less than the original operation in that group with lease land.

The central mid-size operations showed an average increase in net income of 0.8% when less lease pasture acreage was utilized. Decreasing the lease pasture by 1/3 increased net income by 0.1%, decreasing lease pasture acreage by 2/3 reduced net income by 5%, and removing the lease pasture altogether increased income by 5.7%. In these operations, taxes on lease pasture acreage tended to be substantially higher than elsewhere in the Province,(thus higher fixed costs of lease utilization were apparent) which might explain this converse trend. The representative operation with lease utilized only 25% lease acreage. A comparison of the original lease using operation with the non-lease utilizing operation shows a 24% decrease in net income when lease is not utilized. This net income difference is particularly interesting because the deeded pasture acreages for these two operations are identical. With more constancy between these two operations, a greater portion of the 24% decrease in net income can be attributed solely to the non-use of lease land.

Table VI.20: NET INCOME ANALYSIS - CENTRAL REGION

| | PASTURE ACREAGES | | | | CATTLE SALES (HEAD) | | | INCOME ANALYSIS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LEASE STATUS | DEEDED NATIVE | DEEDED IMPROVED | LEASED NATIVE | LEASED IMPROVED | CULL COWS | FEEDER STEERS | FEEDER HEIFERS | INCOME | INCOME DECREASE | PERCENT CHANGE | AVERAGE CHANGE |
| **SMALL** | | | | | | | | | | | |
| FULL | 415 | 0 | 160 | 60 | 6 | 21 | 15 | 6,797 | | | |
| 2/3 | 415 | 0 | 106 | 60 | 6 | 21 | 14 | 6,189 | 608 | 9 | |
| 1/3 | 415 | 0 | 53 | 20 | 5 | 19 | 14 | 4,781 | 2,016 | 30 | 31.3 |
| Removed | 415 | 0 | 0 | 0 | 5 | 18 | 13 | 3,052 | 3,745 | 55 | |
| None | 88 | 82 | 0 | 0 | 3 | 10 | 7 | -1,744 | 8,541 | 126 | |
| **MID SIZE** | | | | | | | | | | | |
| FULL | 175 | 195 | 112 | 13 | 10 | 32 | 22 | 18,991 | | | |
| 2/3 | 175 | 195 | 74 | 9 | 10 | 32 | 22 | 19,167 | -176 | -0.1 | |
| 1/3 | 175 | 195 | 37 | 4 | 9 | 32 | 22 | 17,953 | 1,038 | 5 | -0.8 |
| Removed | 175 | 195 | 0 | 0 | 9 | 31 | 21 | 20,074 | -1,083 | -5.7 | |
| None | 183 | 187 | 0 | 0 | 8 | 26 | 18 | 14,336 | 4,655 | 24 | |
| **LARGE** | | | | | | | | | | | |
| FULL | 80 | 201 | 473 | 28 | 18 | 60 | 41 | 42,619 | | | |
| 2/3 | 80 | 201 | 312 | 19 | 18 | 59 | 39 | 39,677 | 2,942 | 10 | |
| 1/3 | 80 | 201 | 156 | 9 | 17 | 57 | 38 | 38,364 | 4,255 | 10 | 10.5 |
| Removed | 80 | 201 | 0 | 0 | 16 | 55 | 37 | 36,875 | 5,744 | 14.5 | |
| None | 425 | 110 | 0 | 0 | 15 | 49 | 34 | 26,712 | 15,907 | 47 | |

The largest operation held 64% of pasture land as lease. The average decrease in net income when pasture was removed was 10.5%. Decreasing lease pasture by 1/3 reduced net income by 7%, decreasing lease pasture by 2/3 reduced net income by 10%, and removing the lease pasture component reduced net income by 47%.

**Southern Operations**

The southern operations used the largest acreages of lease land of any of the operations examined. They did not, however, display the greatest percentage decrease in net income as lease land components were removed.

The small operation with lease contained 41% lease land. The average decline in net income when lease land was removed was 3.2%. The simulation of a 1/3 decrease in total lease land resulted in a 9.4% increase in net income. A further reduction to 1/3 lease land resulted in an 18% increase in net income. Total removal of lease land produced a net income 9.6% higher than the operation with lease land. The original operation without lease land had a net income 9.6% higher than the original lease utilizing operation.

The midsize southern operations with lease carried a high proportion of lease land (70%). Reductions in the quantity of lease land resulted in an average decline in net income of 13.6%. Decreasing lease land by 1/3 increased net income by 2.6%, decreasing lease land by 2/3 reduced income by 13%, and removal of lease land reduced net income by 17%. The original operation without lease land showed a net income 27% below that of the original operation utilizing lease land.

The southern large operation with lease had 68% of total pasture as lease land. The average decrease in net income when lease pasture was removed was 40%. A decrease in lease pasture by 1/3 resulted in a decline in net income of 16%. Further decreases by 1/3 resulted in a decline in net income of 39%. Total removal of lease land resulted in a 65% decline in net income. The representative operation holding no lease showed a difference in income of 41% less than the operation holding lease.

Table VI.21: NET INCOME ANALYSIS - SOUTHERN REGION

| | PASTURE ACREAGES | | | | CATTLE SALES (HEAD) | | | | INCOME ANALYSIS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LEASE STATUS | DEEDED NATIVE | DEEDED IMPROVED | LEASED NATIVE | LEASED IMPROVED | CULL COWS | FEEDER STEERS | FEEDER HEIFERS | INCOME | INCOME DECREASE | PERCENT CHANGE | AVERAGE CHANGE |
| **SMALL** | | | | | | | | | | | |
| FULL | 340 | 275 | 432 | 0 | 4 | 17 | 12 | 4,039 | | | |
| 2/3 | 340 | 275 | 285 | 0 | 4 | 15 | 12 | 4,209 | -381 | -9.4 | |
| 1/3 | 340 | 275 | 143 | 0 | 4 | 14 | 10 | 3,325 | 714 | 18 | 3.2 |
| Removed | 340 | 275 | 0 | 0 | 4 | 14 | 10 | 3,998 | 41 | 1 | |
| None | 340 | 275 | 0 | 0 | 4 | 14 | 11 | 4,426 | -387 | -9.6 | |
| **MID SIZE** | | | | | | | | | | | |
| FULL | 93 | 183 | 649 | 0 | 13 | 44 | 30 | 28,680 | | | |
| 2/3 | 93 | 183 | 428 | 0 | 13 | 42 | 29 | 29,428 | -748 | -2.6 | |
| 1/3 | 93 | 183 | 214 | 0 | 12 | 40 | 27 | 25,676 | 3,752 | 13 | 13.6 |
| Removed | 93 | 183 | 0 | 0 | 11 | 38 | 26 | 23,837 | 4,843 | 17 | |
| None | 261 | 113 | 0 | 0 | 12 | 41 | 28 | 21,040 | 7,640 | 27 | |
| **LARGE** | | | | | | | | | | | |
| FULL | 3414 | 33 | 7380 | 0 | 37 | 122 | 82 | 77,514 | | | |
| 2/3 | 3414 | 33 | 4871 | 0 | 30 | 97 | 65 | 65,170 | 12,344 | 16 | |
| 1/3 | 3414 | 33 | 2465 | 0 | 22 | 73 | 49 | 47,602 | 29,912 | 39 | 40.0 |
| Removed | 3414 | 33 | 0 | 0 | 14 | 49 | 34 | 27,311 | 50,203 | 65 | |
| None | 900 | 0 | 0 | 0 | 18 | 61 | 41 | 45,739 | 31,775 | 41 | |

Changes in net income due to changes in the lease land held by representative operations provides a means of comparing the likelihood of net income gains or losses over time when lease land allocations are altered. This examination also provides a measure of the degree of dependency of cattle operators on the lease land component of their operations.

A comparison of the operations originally holding lease pasture with those not holding lease shows in only one instance that the net income of the non-lease using operation is greater than that of the lease utilizing operation. (The southern-small operation showed a 9.6% higher net income where lease was not used.) Thus, the likelihood of having higher net incomes when lease lands are utilized is shown.

Most operations suffered a decline in net income, even when only one third of the lease land associated with their operations was removed. As a second 1/3 was removed most operations experienced a further decline in net income, and the greatest decline was shown when all of the lease component was removed. Three exceptions to this generality exist. One is in the central mid-size operation where a decrease by 1/3 of the lease component resulted in a 0.1% increase in income, and total removal of lease land resulted in a 5.7% increase in income. This operation held only 25% of the pasture land base in the form of lease land. Thus in examining cattle sales one can see the number of cattle sold varies only with decreases in lease land. Here a situation exists where the MFC>MVP, both above and below the 1/3 lease mark. One can assume the most profitable point at which an operation such as this would utilize lease land would be somewhere near the 1/3 lease point.

The second operation displaying increasing incomes with decreasing amounts of lease land was the southern small operation, where a decrease of 1/3 of the lease land base resulted in a net income gain of 9.4%. Similarly, the original representative operations with no lease land portion produced a net income 9.6% higher than the original representative operation with lease land. This representative operation held only 41% of total pasture land as lease pasture.

The third operation showing this atypical result was the southern midsize operation, where a decrease of 1/3 of the lease land component resulted in a net income gain of 2.6%.

**D. Costs per Head**

Changes in net income are composed of a variation in receipts and expenses; both for the cattle enterprise and other enterprises on the particular ranch/farm being examined. As lease pastureland is removed as a component of pasture, inputs are freed, and other enterprises will receive these additional inputs and utilize them. For example, as less labour and input capital are spent on the cattle operation, due to decreases in lease and herd size, these inputs will be utilized in the crops operation etc.

These shifts may not be totally obvious from examination of crop and other receipts, because of the utilization of primary products as inputs into secondary product production. Much of the crop land in cattle operations is devoted to the production of barley or oats, or other crops which may be utilized partly or wholly as feed for cattle, hogs etc. Thus as pasture acreage decreases, more hay and barley will be fed to the cattle to make up for the difference in pasture acreage. Thus increased yields of barley may not show up in crop receipts, as they are utilized as an input of cattle feed.

Purchases of feed, supplements, etc. will show up in the portions of expenses pertaining to cattle. It is in these expenses that the cost in terms of cattle expenses only of getting a calf to market will be revealed.

Total cattle expenses are composed of the following elements:

1. supplement and protein costs;
2. hay costs;
3. feed grain purchases;
4. lump sum expenditures on fence and water development on lease; [62]
5. annual costs of maintaining the above developments;
6. pasture fertilizer costs;
7. repairs to machinery pertaining to cattle;
8. purchases of machinery pertaining to cattle;

---

[62]This expenditure is incurred in year two of the simulation and as such will not appear in year five cattle expenses.

9. bedding purchases;
10. pasture costs (annual rental and taxes); and
11. cash costs of transporting cattle to lease.

Expenses vary somewhat from year to year with differences in feed purchases, machinery repairs, etc.. This stochasticity is inherent in any operation. In choosing an arbitrary year for examination (year five) this stochasticity will be random, and not influence the direction of change of cattle expenses.

Cattle expenses show expected trends in that as the number of head are decreased cattle expenses decrease. In all cases cattle expenses on the operations holding no lease originally are less than the original operations holding lease pasture. In order to make these expenses more meaningful, it is helpful to express them in terms of the number of cattle that total expenses accrue to. Cattle expenses are expressed on a per head basis in Table VI.22.

When expenses are accounted for on a per head basis, the trends in costs loose their clarity. Five kinds of operations showed a decrease in costs as lease land was reduced from the original lease land quantity. These were central-large, central-mid-size, southern-large, southern-midsize, and southern-small. One operation, northern-midsize, showed just the opposite reaction, with costs per head increasing as lease land was decreased. Two operations showed an initial increase in costs, as lease land was reduced by 1/3, and then a reduction in costs (northern-large and northern-small). One operation showed a decrease in costs until the lease was removed entirely, and then costs increased to higher than the original costs with lease (central-small). Since cattle expenses are composed of a number of expenses, some costs will be increasing, and some decreasing to cause these fluctuations. For example, when lease land is decreased, total costs of feed for cattle may increase as supplemental feed is required. Alternatively, as pasture is decreased, the costs associated with the utilization of lease land also decrease, and costs overall may decrease. It is the balance of costs attributable to lease utilization, and attributable to other sources which creates an increase or decrease in costs as lease content of ranches is changed. Thus it can be concluded that in some of the representative

**Table VI.22: CATTLE EXPENSES PER HEAD SOLD**
$'s Per Head

| OPERATION LARGE | COST PER HEAD | OPERATION MIDSIZE | COST PER HEAD | OPERATION SMALL | COST PER HEAD |
|---|---|---|---|---|---|
| **NORTHERN** | | | | | |
| Full Lease | 102.40 | Full Lease | 112.60 | Full Lease | 132.53 |
| 2/3 Lease | 103.60 | 2/3 Lease | 115.10 | 2/3 Lease | 135.53 |
| 1/3 Lease | 99.66 | 1/3 Lease | 119.00 | 1/3 Lease | 102.53 |
| Lease Removed | 102.24 | Lease Removed | 128.10 | Lease Removed | 111.18 |
| No Lease | 97.05 | No Lease | 122.70 | No Lease | 125.76 |
| **CENTRAL** | | | | | |
| Full Lease | 96.40 | Full Lease | 101.10 | Full Lease | 115.30 |
| 2/3 Lease | 86.22 | 2/3 Lease | 98.80 | 2/3 Lease | 112.42 |
| 1/3 Lease | 85.99 | 1/3 Lease | 98.30 | 1/3 Lease | 112.21 |
| Lease Removed | 52.35 | Lease Removed | 97.73 | Lease Removed | 121.86 |
| No Lease | 77.73 | No Lease | 102.36 | No Lease | 102.95 |
| **SOUTHERN** | | | | | |
| Full Lease | 132.49 | Full Lease | 119.24 | Full Lease | 211.48 |
| 2/3 Lease | 132.44 | 2/3 Lease | 109.74 | 2/3 Lease | 174.50 |
| 1/3 Lease | 128.50 | 1/3 Lease | 106.88 | 1/3 Lease | 174.14 |
| Lease Removed | 123.30 | Lease Removed | 100.81 | Lease Removed | 156.75 |
| No Lease | 93.05 | No Lease | 97.09 | No Lease | 153.24 |

operations, reduction of the lease portion of pasture land will result in cost per head increasing, and in some the costs per head will decrease.

**Net Income from the Cattle Enterprise**

Costs per head indicate a portion of cattle expenses attributable to each cow, feeder, etc. on an equal basis. Some arbitrary division of costs among animals exists in examining costs this way, as cull cows may have required more inputs in some periods than feeder steers and heifers, and vice versa.

Cattle receipts are of interest in the accounting exercise. Just as costs per head may be somewhat arbitrarily allocated due to some variation in cost per animal, each kind of animal produced will obtain a different price. As such cattle receipts should be examined as the alternate face of cattle expenses. In comparing these two values, the net income attributable to the cattle operation is produced. These net incomes are shown in Tables VI.23, VI.24, and VI.25. Net incomes from the cattle operations show similar trends to overall net incomes. In all cases except two, net incomes from the cattle operations are reduced when the lease land components of the operation are decreased. Furthermore, only one operation (the southern-small operation) showed a net income from the cattle operation that was greater without lease than with lease.

Two operations (the central-midsize and southern-small operations) showed a net income increase when lease lands were decreased. The central-midsize operation only showed this trend when lease land was reduced by 1/3. Otherwise it showed a decrease in net income when lease land was reduced by 2/3, and removed. The southern-small operation similarly showed a greater net income when 2/3 lease as opposed to full lease quantities were utilized.

Cattle expenses per head were shown to increase or decrease with reductions in lease land depending on the operation being examined. However, in all cases but two, (and only for 1/3 removal of lease) the net income derived from the cattle operation was enhanced through the use of lease land; and in only one representative operation was the use of lease land less

**Table VI.23: NET INCOME FROM CATTLE OPERATIONS FOR NORTHERN OPERATIONS**

Farm Statement at End of Fifth Year

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| LARGE OPERATIONS | | | | | |
| Cattle Receipts | 131274 | 111971 | 93132 | 73969 | 117799 |
| Cattle Expenses | 23048 | 19785 | 15861 | 12882 | 19562 |
| Net Income - Cattle | 108331 | 92186 | 77286 | 61087 | 98291 |
| MIDSIZE OPERATIONS | | | | | |
| Cattle Receipts | 49780 | 44045 | 38142 | 31120 | 39338 |
| Cattle Expenses | 9592 | 8643 | 7740 | 6787 | 8221 |
| Net Income - Cattle | 40205 | 35413 | 30407 | 24333 | 31117 |
| SMALL OPERATIONS | | | | | |
| Cattle Receipts | 21141 | 18826 | 16434 | 13477 | 19946 |
| Cattle Expenses | 4771 | 4337 | 2871 | 2446 | 4276 |
| Net Income - Cattle | 16370 | 14489 | 13563 | 11031 | 15670 |

**Table VI.24: NET INCOME FROM CATTLE OPERATIONS FOR CENTRAL OPERATIONS**

Farm Statement at End of Fifth Year

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| LARGE OPERATIONS | | | | | |
| Cattle Receipts | 69815 | 68067 | 65752 | 63436 | 57445 |
| Cattle Expenses | 11469 | 10001 | 9519 | 9057 | 7618 |
| Net Income - Cattle | 58346 | 58066 | 56233 | 54379 | 49827 |
| MIDSIZE OPERATIONS | | | | | |
| Cattle Receipts | 37499 | 37499 | 37023 | 35827 | 30478 |
| Cattle Expenses | 6473 | 6329 | 6193 | 5962 | 5323 |
| Net Income - Cattle | 31030 | 31172 | 30830 | 29865 | 25155 |
| SMALL OPERATIONS | | | | | |
| Cattle Receipts | 24652 | 24099 | 22337 | 21141 | 11728 |
| Cattle Expenses | 4844 | 4609 | 4264 | 4387 | 2059 |
| Net Income - Cattle | 19808 | 19490 | 18073 | 16754 | 9669 |

**Table VI.25: NET INCOME FROM CATTLE OPERATIONS FOR SOUTHERN OPERATIONS**

Farm Statement at End of Fifth Year

| | Full Lease | 2/3 Lease | 1/3 Lease | Lease Removed | Non Lease Using |
|---|---|---|---|---|---|
| LARGE OPERATIONS | | | | | |
| Cattle Receipts | 141254 | 112449 | 84363 | 56968 | 70458 |
| Cattle Expenses | 31930 | 25430 | 18508 | 11960 | 11167 |
| Net Income - Cattle | 109324 | 87019 | 65855 | 45008 | 59291 |
| MIDSIZE OPERATIONS | | | | | |
| Cattle Receipts | 51066 | 49228 | 46359 | 44045 | 47555 |
| Cattle Expenses | 10374 | 9601 | 8444 | 7561 | 7865 |
| Net Income - Cattle | 40692 | 40010 | 37915 | 36484 | 39690 |
| SMALL OPERATIONS | | | | | |
| Cattle Receipts | 19469 | 18183 | 16434 | 16434 | 16987 |
| Cattle Expenses | 6979 | 5410 | 4876 | 4389 | 4444 |
| Net Income - Cattle | 12490 | 12773 | 11558 | 12045 | 12543 |

profitable than non-use of lease land.

Utilization of lease land enhanced the net income derived from the cattle operation even though expenses per head were shown to have increased in many cases when lease land was utilized. This result can be illustrated by the following example. A rancher using deeded pastureland to graze his cattle will not incur any costs of leasing pastureland, and thus his cattle expenses per head will be less. If, however, he leases pastureland, the decreased usage of his deeded pastureland will allow for better cattle weight gains on pasture, and may also allow him to utilize at least some of his deeded pasture for other purposes, such as hay production, and may decrease his feed costs overall. That is to say, although the use of lease pasture incurs expenses, the benefits derived from its use may exceed these expenses.

**E. Range Improvement Costs**

The three range improvement cost scenarios were developed from three data sources. Some of the interviewees were able to offer estimates of the costs of breaking, seeding, etc., and where this information was available it was used. Other cost estimates were taken from the base data existent in the model, and from alternate publications.[63] The three scenarios created are presented in Table VI.26.

The costs of range improvement were only undertaken by six of the 49 interviewees, and three of the six only took on seeding costs. As such these costs may not be normally incurred by lessees.[64] Range improvement costs have been attributed to cattle expenses. Their effect on net incomes and equity thus appear with other cattle expenses. These costs have been assigned to the second year of simulation as other lump sum costs and, as such, do not appear as cattle expenses in year 5. Their existence is noted in current assets where reductions in cash and reductions in 'other receipts' are seen.

---

[63]For example, Farm Business Management Section. 1980. "Costs of Owning a Pasture".

[64]Other range improvements are undertaken by proportionately more lessees, such as brush clearing etc..

Table VI.26: RANGE IMPROVEMENT COSTS PER ACRE

| ACTIVITY | LOW | MEDIUM | HIGH |
|---|---|---|---|
| Clearing | $50 | $100 | $150 |
| Breaking | $20 | $35 | $50 |
| Seeding[1] | $13 | $16 | $20 |
| Total Cost | $83 | $151 | $220 |

[1]Including seed costs

The expected lifetime of pasture improvement may be expected to span approximately 10 years. This estimate is of course subject to variability depending on local conditions.

Range improvements have been carried out on one representative operation with lease to show these changes. The central mid-size operation was chosen for this trial. An improvement of 20 acres was chosen for illustrative purposes. The results are presented in Tables VI.27, VI.28, and VI.29.

These costs, like lump sum expenses of water and fence development, have caused a decrease in cash assets and a reduction in 'other receipts'. As the higher cost scenario was undertaken, the decreases in cash assets were the greatest, and the lowest cost scenario produced the smallest decreases in cash assets and other receipts. It should however be noted that these increased costs would only be experienced in the initial year of improvement, while the increased carrying capacity provided by the improvement would remain over its lifetime.

**F. Assignment Fees**

Fixed costs not treated explicitly thus far are assignment fees. Assignment fees *per se* pertain only to parcels of lease land obtained directly from Energy and Natural Resources through the Public Lands Division. All other transactions (ex. transfer from father to son) are covered by a transfer fee which varies depending on the nature of the transfer.[65] Because assignment fee values vary between operations and because assignment fees are not the norm in areas where lease land is generally unavailable from the crown,[66] they have not been treated as usual costs. For purposes of exposition however, two examples are provided to show the effect of assignment fees on the livelihood of two operations, and on the economic feasibility of utilizing lease lands. Because acquisition of lease lands to which assignment fees apply are generally in midwestern and northern portions of the Province, central-large and

---

[65] For further information see The Public Lands Act, Alberta Regulation 155/76.
[66] Alberta Energy and Natural Resources, Public Lands Division states in their information sheet: *Information Regarding Leasing of Grazing Lands in Alberta, 1983.*"Available public lands are confined mostly to the mid western and northern portions of the Province."

**Table VI.27: BUSINESS SUMMARY WITH RANGE IMPROVEMENT COSTS FOR CENTRAL MIDSIZE OPERATIONS - LOW COST SCENARIO**

Farm Statement at End of Fifth Year

| | Full Lease | 2/3 Lease | 1/3 Lease |
|---|---|---|---|
| ASSETS | | | |
| CURRENT ASSETS | | | |
| Cash | 40484 | 41212 | 25914 |
| Crops | | | |
| Mixed Hay | 6993 | 6734 | 5864 |
| Barley | 7433 | 7405 | 7275 |
| Oilseed | 3621 | 3621 | 3621 |
| Total Crop | 18047 | 17760 | 16760 |
| Livestock | | | |
| Bulls | 3000 | 3000 | 3000 |
| Cows | 32975 | 32497 | 32258 |
| Bred Heifers | 6863 | 6863 | 6239 |
| Repl. Heifers | 4196 | 4196 | 3815 |
| Steer Calves | 14202 | 14202 | 14202 |
| Heifer Calves | 8393 | 8393 | 8774 |
| Total Livestock | 69629 | 69151 | 68288 |
| Total Current Assets | 128160 | 158123 | 110962 |
| FIXED ASSETS | | | |
| Land | | | |
| Deeded Pasture | 96250 | 96250 | 96250 |
| Improved Pasture | 117000 | 117000 | 117000 |
| Crop Land | 338000 | 338000 | 338000 |
| Native Hay | 47600 | 47600 | 47600 |
| Grass-Legume Hay | 28000 | 28000 | 28000 |
| Total Land | 626850 | 626850 | 626850 |

**TABLE VI.27: Continued**

| | Full Lease | 2/3 Lease | 1/3 Lease |
|---|---|---|---|
| Total Buildings | 28961 | 28841 | 28721 |
| Total Machinery | 101810 | 101810 | 101810 |
| Total Fixed Assets | 757621 | 757501 | 757381 |
| Other Assets | 3881 | 3995 | 3643 |
| Total Assets | 889662 | 889619 | 871986 |
| Liabilities | 0 | 175 | 0 |
| Beginning Equity | 887348 | 887129 | 870589 |
| Total Net Income | 18991 | 19167 | 17953 |
| Living Expenses | 14715 | 14715 | 14715 |
| Income Tax | 0 | 0 | 0 |
| Addition to Equity | 2314 | 2315 | 1222 |
| Ending Equity | 889662 | 889444 | 871811 |

**Table VI.28: BUSINESS SUMMARY WITH RANGE IMPROVEMENT COSTS FOR CENTRAL MIDSIZE OPERATIONS - MID-COST SCENARIO**

Farm Statement at End of Fifth Year

| | Full Lease | 2/3 Lease | 1/3 Lease |
|---|---|---|---|
| ASSETS | | | |
| CURRENT ASSETS | | | |
| Cash | 38874 | 39408 | 24313 |
| Crops | | | |
| Mixed Hay | 6993. | 6734 | 5864 |
| Barley | 7433 | 7405 | 7275 |
| Oilseed | 3621 | 3621 | 3621 |
| Total Crop | 18047 | 17760 | 16760 |
| Livestock | | | |
| Bulls | 3000 | 3000 | 3000 |
| Cows | 32975 | 32497 | 32258 |
| Bred Heifers | 6863 | 6863 | 6239 |
| Repl. Heifers | 4196 | 4196 | 3815 |
| Steer Calves | 14202 | 14202 | 14202 |
| Heifer Calves | 8393 | 8393 | 8774 |
| Total Livestock | 69629 | 69151 | 68288 |
| Total Current Assets | 126550 | 126319 | 109361 |
| FIXED ASSETS | | | |
| Land | | | |
| Deeded Pasture | 96250 | 96250 | 96250 |
| Improved Pasture | 117000 | 117000 | 117000 |
| Crop Land | 338000 | 338000 | 338000 |
| Native Hay | 47600 | 47600 | 47600 |
| Grass-Legume Hay | 28000 | 28000 | 28000 |
| Total Land | 626850 | 626850 | 626850 |

**TABLE VI.28: Continued**

| | Full Lease | 2/3 Lease | 1/3 Lease |
|---|---|---|---|
| Total Buildings | 28961 | 28841 | 28721 |
| Total Machinery | 101810 | 101810 | 101810 |
| Total Fixed Assets | 757621 | 757501 | 757381 |
| Other Assets | 3881 | 3995 | 3643 |
| Total Assets | 888052 | 887815 | 870385 |
| Liabilities | 0 | 175 | 0 |
| Beginning Equity | 887348 | 887129 | 870589 |
| Total Net Income | 18991 | 19167 | 17953 |
| Living Expenses | 14715 | 14715 | 14715 |
| Income Tax | 0 | 0 | 0 |
| Addition to Equity | 704 | 511 | 204 |
| Ending Equity | 888052 | 887640 | 870385 |

**Table VI.29: BUSINESS SUMMARY WITH RANGE IMPROVEMENT COSTS FOR CENTRAL MIDSIZE OPERATIONS - HIGH-COST SCENARIO**

Farm Statement at End of Fifth Year

| | Full Lease | 2/3 Lease | 1/3 Lease |
|---|---|---|---|
| ASSETS | | | |
| CURRENT ASSETS | | | |
| Cash | 37226 | 37968 | 22698 |
| Crops | | | |
| Mixed Hay | 6993 | 6734 | 5864 |
| Barley | 7433 | 7405 | 7275 |
| Oilseed | 3621 | 3621 | 3621 |
| Total Crop | 18047 | 17760 | 16760 |
| Livestock | | | |
| Bulls | 3000 | 3000 | 3000 |
| Cows | 32975 | 32497 | 32258 |
| Bred Heifers | 6863 | 6863 | 6239 |
| Repl. Heifers | 4196 | 4196 | 3815 |
| Steer Calves | 14202 | 14202 | 14202 |
| Heifer Calves | 8393 | 8393 | 8774 |
| Total Livestock | 69629 | 69151 | 68288 |
| Total Current Assets | 124902 | 124879 | 107746 |
| FIXED ASSETS | | | |
| Land | | | |
| Deeded Pasture | 96250 | 96250 | 96250 |
| Improved Pasture | 117000 | 117000 | 117000 |
| Crop Land | 338000 | 338000 | 338000 |
| Native Hay | 47600 | 47600 | 47600 |
| Grass-Legume Hay | 28000 | 28000 | 28000 |
| Total Land | 626850 | 626850 | 626850 |

**TABLE VI.29: Continued**

| | Full Lease | 2/3 Lease | 1/3 Lease |
|---|---|---|---|
| Total Buildings | 28961 | 28841 | 28721 |
| Total Machinery | 101810 | 101810 | 101810 |
| Total Fixed Assets | 757621 | 757501 | 757381 |
| Other Assets | 3881 | 3995 | 3643 |
| Total Assets | 886404 | 8863754 | 868770 |
| Liabilities | 0 | 175 | 0 |
| Beginning Equity | 887348 | 887129 | 869311 |
| Total Net Income | 18991 | 19167 | 17953 |
| Living Expenses | 14715 | 14715 | 14715 |
| Income Tax | 0 | 0 | 0 |
| Addition to Equity | -944 | -754 | -541 |
| Ending Equity | 886404 | 886375 | 868770 |

northern-large representative operations are used.

The northern-large operation is characterized as having an approximate carrying capacity of 40 ac./AU for native pasture, and an approximate carrying capacity of 20 ac./AU for improved pasture.[67] According to the assignment fee schedule,[68] capacities in this area are $0.86 per acre for native pasture, and $1.72 per acre for improved pasture. These costs have been attributed to the first year of operation, and the 5th year of the simulation is examined in Table VI.30 to determine the effects of these fees.

The central-large operation possessed approximate carrying capacities of 35 ac./AU for native pasture, and 20 ac./AU for improved pasture. The assignment fees have been applied to the central-large operations, and the results are shown in Table VI.31.

Addition of the assignment fee for the northern-large operation resulted in a net income decline, and reduced cash assets. The net income decline results from a decrease in 'other receipts' (primarily interest on cash holdings). With decreased cash assets, this value is expected to decline as well.

The northern-large operation without the assignment fee added displays a higher net income than the same operation with this fee. The northern-large operation originally containing no lease displays a net income below that of the operation holding full lease, even with the addition of assignment fees to the full lease operation.

The central-large operation showed a lower net income when the assignment fee was added onto the full lease operation. As with the northern operation, the original operation without lease land displayed a lower net income than did the original full lease operation with assignment fees added. Thus it can be concluded that even with the assignment fees as additional costs, the use of lease land is advantageous.

It should be noted that rarely would an application fee for such large amounts of lease land occur. Leases are generally awarded as 1/4 sections or 1/2 sections of land initially, and then operators may apply for further land parcels at a later date. As such the assignment fees

---

[67]These values are taken from interview responses.
[68]These fees are presented in Table I.3

**Table VI.30: FARM BUSINESS SUMMARY FOR NORTHERN LARGE OPERATIONS - EFFECTS OF ASSIGNMENT FEE**
Farm Statement at End of Fifth Year - Full Lease

| | WITH ASSIGNMENT FEE | WITHOUT ASSIGNMENT FEE | WITHOUT LEASE LAND |
|---|---|---|---|
| ASSETS | | | |
| Current Assets | | | |
| Cash | 115792 | 120811 | 238057 |
| Crops | | | |
| Mixed Hay | 120890 | 120890 | 88384 |
| Barley | 14178 | 14178 | 14064 |
| Oilseed | 4827 | 4827 | 4827 |
| Total Crop | 139895 | 139895 | 107275 |
| Livestock | | | |
| Bulls | 11000 | 11000 | 10000 |
| Cows | 114456 | 114456 | 103225 |
| Bred Heifers | 23708 | 23708 | 21836 |
| Repl. Heifers | 14467 | 114467 | 13322 |
| Steer Calves | 49390 | 49390 | 44656 |
| Heifer Calves | 29696 | 29696 | 26264 |
| Total Livestock | 242717 | 242717 | 219303 |
| Total Current Assets | 498404 | 503423 | 564635 |
| Fixed Assets | | | |
| Land | | | |
| Deeded Pasture | 311600 | 311600 | 311600 |
| Improved Pasture | 92000 | 92000 | 14440 |
| Crop Land | 317250 | 317250 | 317250 |
| Native Hay | 240000 | 240000 | 240000 |
| Grass-Legume Hay | 175800 | 175800 | 175800 |
| Total Land | 1136650 | 1136650 | 1136650 |
| Total Buildings | 54156 | 54156 | 54156 |
| Total Machinery | 175054 | 175054 | 175054 |
| Total Fixed Assets | 1365860 | 1365860 | 1288521 |
| Other Assets | 14524 | 14524 | 14105 |
| Total Assets | 1878788 | 1883807 | 1867261 |
| Liabilities | 0 | 0 | 0 |
| Beginning Equity | 1844232 | 1844232 | 1828109 |
| Net Income | 55662 | 55914 | 55199 |
| Living Expenses | 16326 | 16339 | 15310 |
| Income Tax | 0 | 0 | 0 |
| Equity Addition | 34556 | 39575 | 39152 |
| Ending Equity | 1878788 | 1883807 | 1867261 |

**Table VI.31: FARM BUSINESS SUMMARY FOR CENTRAL LARGE OPERATIONS - EFFECTS OF ASSIGNMENT FEE**

Farm Statement at End of Fifth Year - Full Lease

| | WITH ASSIGNMENT FEE | WITHOUT ASSIGNMENT FEE | WITHOUT LEASE LAND |
|---|---|---|---|
| ASSETS | | | |
| Current Assets | | | |
| Cash | 198919 | 205727 | 75811 |
| Crops | | | |
| Mixed Hay | 71897 | 71897 | 79357 |
| Barley | 8805 | 8805 | 8708 |
| Oilseed | 4122 | 4122 | 4122 |
| Total Crop | 84824 | 84824 | 92187 |
| Livestock | | | |
| Bulls | 6000 | 6000 | 5000 |
| Cows | 61170 | 61170 | 50418 |
| Bred Heifers | 12478 | 12478 | 10606 |
| Repl Heifers | 7630 | 7630 | 6485 |
| Steer Calves | 26251 | 26251 | 21517 |
| Heifer Calves | 16022 | 16022 | 12970 |
| Total Livestock | 129551 | 129551 | 106996 |
| Total Current Assets | 413294 | 420102 | 274994 |
| Fixed Assets | | | |
| Land | | | |
| Deeded Pasture | 28000 | 28000 | 28000 |
| Improved Pasture | 80400 | 80400 | 44000 |
| Crop Land | 300300 | 300300 | 300300 |
| Native Hay | 156000 | 156000 | 156000 |
| Grass-Legume Hay | 60000 | 60000 | 60000 |
| Total Land | 624700 | 624700 | 709050 |
| Total Buildings | 63066 | 63066 | 34299 |
| Total Machinery | 115850 | 115850 | 115850 |
| Total Fixed Assets | 803616 | 803616 | 859199 |
| Other Assets | 0 | 0 | 0 |
| Total Assets | 1216910 | 1223718 | 1134193 |
| Liabilities | 0 | 0 | 0 |
| Beginning Equity | 1202480 | 1203480 | 1129436 |
| Net Income | 42287 | 42619 | 26712 |
| Living Expenses | 15568 | 15577 | 15131 |
| Income Tax | 6804 | 6804 | 544 |
| Equity | 14430 | 20238 | 11037 |
| Ending Equity | 1216910 | 1223718 | 1137333 |

utilized here for exposition tend to be higher than would be the case for lump sum payments of this kind.

## VII. Summary and Conclusions

### A. Summary and Conclusions

This study involved the creation of nine representative Alberta cattle operations based largely on an interview survey of fifty randomly selected operators throughout the Province. A computer simulation model developed for Western Canadian cattle operations was used to observe changes in the capital structure, net income earning potential, and cattle expenses of these operations under different proportions of lease pasture and owned pasture.

The changes in lease proportions resulted in alterations of all three criteria being examined. Trends were easily identified in the capital structure and net income criteria; changes accruing to cattle expenses are less explicit.

Capital structure variations originating from alterations in quantities of lease and owned pasture are manifested in current assets and equity. As lease pasture was removed from each representative cattle operation, a reduction in current assets was displayed. A concurrent reduction in equity of each operation was also shown.

Net incomes in almost all of the representative operations utilizing lease land declined as parts or all of lease land was removed. Three exceptions were in the central mid-size, southern midsize, and southern small operations. These operations showed an increase in net income when 1/3 of the lease component of pasture was removed. These operations also had in common the lowest proportion of lease pasture in their pasture land inventories of all of the operations examined. An explanation for this atypical result may be that the original full lease operation had excess lease pasture. In other words the total cost of lease land, composed of taxes, rent and improvement costs exceeded the value of the lease land to the operator at that level of use.

A comparison of the net incomes of cattle operations utilizing lease pasture with those not utilizing lease pasture revealed only one instance in which the net income from the non-lease utilizing operation was greater than the comparable lease-using operation. This case

was the southern small operation.

Caution must be used in interpreting the results which compare operations which do not hold the same fixed assets and inventories. Differing assets may be an additional cause of variation in the business criteria being examined. In the interests of accurately modeling cattle operations, some dissimilarities in assets do exist. These differences must be considered when examining comparative capital structures and net incomes. Inasmuch as this caution is necessary, the presence of some dissimilarities does not discredit the comparison. In some cases the magnitude of dollar value differences attributable to lease vs. non lease arrangements may be distorted somewhat, but the order of magnitude of the difference is valid. This problem exists only when comparing the full lease and non lease using operations.

Cattle expenses, expressed on a per head basis, were less on non-lease utilizing operations than on lease using operations in all but two cases. When proportions of lease pastureland were reduced, some operations displayed increases in costs per head, while others displayed decreases. Since cattle expenses are composed of a number of components, the balance of increases and decreases in these costs must be considered. For example, as pasture costs increase, (due to the utilization of greater amounts of lease land), supplemental feed costs decrease. Thus costs per head provide somewhat misleading values, as decreasing lease pasture acreage may not decrease cattle expenses on a per head basis. Cattle receipts were also examined to determine the marginal value product half of the equation. In all cases except two, net income from the cattle portion of the entire operation decreased as lease pasture was reduced.

The defined problem stated that the actual value of crown grazing lands was unknown, so that efficient or equitable allocation was elusive. The value of lease grazing lands can be measured in a number of ways from the results presented. Value of a cattle operation to the owner depends on his goals. Earning profit is an important purpose, and this goal is best measured using net income analysis. While earning profit is an important goal for the owner, it is not generally the only goal nor often the most important one. Security of operation and business growth are goals also important to an owner. These goals are better measured through

equity and changes in equity measures.

Net income analysis has shown that in the majority of cases, net income earning potential is greater where lease land is utilized. The value of that potential is seen in the difference in net incomes between with and with-out cases. For each kind of operation specified these differences are expressed in absolute values and percentage differences. The percentage differences are of the most value when translating results to other situations outside of this study. For example, the northern large full lease operation earned 66% more net income with than without lease. Thus the value of lease pasture to that operation is clear.

In a similar comparison, the northern large size operation holding no lease pasture earned only slightly less net income than when utilizing full lease. Only a one percent difference in net income between these types of operations was shown.

The stepwise reductions of lease pasture show clearly the dependence on crown lands by lease holding operations. The presence of lease pasture has fostered a business structure dependent on the availability of that pasture. This dependence was shown clearly through simulated reductions of lease pasture which prompted severe reductions in net incomes.

The analysis of capital structure provides insight into the security of the cattle operations and an indication of its growth potential. Growth can be defined as the change in equity from one point in time to another. As proportions of lease pasture are reduced, the value of current assets declines, and equity is reduced. As lease pasture is reduced as in the 1/3 lease and lease removed simulations, liabilities for short term capital loans occur. The presence of liabilities indicates that the reduction of current assets leads to shortages of operating capital.

Similarly, equity in the operations is affected when quantities of lease land are reduced. Positive additions to equity are seen in the large and midsize operations even when lease proportions are reduced. Northern midsize operations are exceptions. The value of the positive additions declines when lease land quantities are reduced. Thus business growth is enhanced when lease pasture is utilized. The magnitude of the difference in added equity in the large

operations is as much as $20,000.00 annually.

The small operations all show declines in equity, whether lease land is utilized or not. Where it is present however, reduction in equity is slowed. The declining equity values indicate that smaller operations have questionable viability. In light of lower product prices and increased costs of operation in recent years, smaller operations with lower total assets have suffered especially. The value of lease land, when analysed by way of capital structure, is reflected in increased current assets and increased equity values both of which contribute to business growth.

One aspect of lease land values that has not been considered explicitly is the permit value. Where a positive value of lease land can be capitalized into the base value of an operation upon sale, or where the right to utilize lease pasture can be transferred, the permit value is positive. The permit value has not been addressed explicitly because of problems inherent in determining transfer values.

**B. Implications**

Empirical analysis has shown that the net value of lease lands to cattle operators is positive. Policy makers must determine whether the positive value inherent in their use is desirable, or whether another use might capture a greater value (that is, whether this use is an efficient one).

In the original policy statement issued with regard to public grazing lease lands in the late 1800's, it stated that the intent of allocating public grazing lands was to assist lower income ranchers. Supporting their operations through lease holdings provided the opportunity to maintain an economical unit. If this policy still stands, the positive value of lease grazing lands to ranchers may render the policy as an acceptable and desirable one.

Concerns are raised however when the distribution of the value of lease land is taken into consideration. The higher income ranchers may be benefitting as much or more from the use of public grazing lands than lower income ranchers. Consequently, a change in allocation

policy may be in order. With any policy change, the wealth loss which may be expected by those operators relinquishing lease land must be justified in terms of equity criteria and subsequent wealth gains in other sectors and to other individuals.

Concern has been raised that lessees of crown grazing lands do not pay a 'fair market value' for the use of these lands. If the intent of allocating lease is to provide a subsidy, and if the incomes of many of the cattle ranchers benefitting from lease lands is below the national average, (as many of them are), then perhaps this subsidy should not take on a negative connotation. The amount of subsidy deemed desirable must be measured in relation to alternate individuals and sectors who could be benefitting from the use of these lands.

An assessment of the value of lease lands to the citizens of Alberta must consider the opportunity cost of other uses of these lands if efficient resource allocation or income distribution measures are to be utilized in policy decisions.

## VIII. Bibliography


Agriculture Canada. 1984. **Food Market Commentary**. Minister of Supply and Services, Vol.6 No. 1.

Alberta Energy and Natural Resources. 1983. **Annual Report March 31st, 1983**. ENR Rpt. No. 1/2-82/83.

Alberta Energy and Natural Resources. 1980. **Annual Report March 31st, 1980**. ENR Rpt. No. 1/2-79/80.

Alberta Energy and Natural Resources, Lands Division. 1975. **Alberta Grazing Reserves - Their Economic Contribution 1970-1974.**

Alberta Energy and Natural Resources, Lands Division. 1976. **Provincial Grazing Reserves - A Development Proposal.**

Anderson, Terry L. and Hill, Peter J. 1983. "Privatizing the Commons: An Improvement?" *Southern Economic Journal*, Vol.50 No.2.

Babb, E.M. and French, C.E. 1963. "Use of Simulation Procedures." *Journal of Farm Economics*, 45(1963). 876-877.

Barkley, Paul W. 1983. "Discussion: Implications of the 1980s for Agriculture and Rural Communities in the West". *Western Journal of Agricultural Economics*, Vol.8 No.2 241-245.

Barichello, Richard R. 1978. "An Economic and Distributive Evaluation of Community Pasture Programs". Department of Agricultural Economics, University of British Columbia. unpublished. Indianapolis: Liberty Press.

Bauer,L., Petersen,T.A., and Lougheed,T.J. 1981. **The Farm Management Field Laboratory - Its Concept and Objective and The 1980 Business Summary.**

Bauer,L., Petersen,T.A., and Lougheed,T.J. 1984. **An Analysis of the Capital Structure and Earning Performance of 16 Alberta Case Farms 1980 to 1983.**

Brewer, Michael F. 1962. "Public Pricing of Natural Resources." *Journal of Farm Economics*, Vol.44 No.1, 35-49.

Bromley, Daniel W. 1978. "Property Rules, Liability Rules, and Environmental Economics." *Journal of Economic Issues*,Vol. XII, No. 1 43-60.

Bromley, Daniel W. 1982. "Land and Water Problems: An Institutional Perspective". *American Journal of Agricultural Economics*. Vol.64 No.1 834-844.

Brubaker, Sterling. 1977. "Land - The Far Horizon." *American Journal of Agricultural Economics*, Vol. 59, No. 5 , 1037-1044.

Buchanan, J.M. 1979. "What Should Economists Do?" Indianapolis : Liberty Press.

Charlton, P.J., and Thompson, S.C. 1970. "Simulation of Agricultural Systems." *Journal of Agricultural Economics*, Vol. 21 373-384.

Chryst, Walter E. and Beck, W.B. 1966. "Perspectives on Content and Methodology of Land Economics". in **Methods for Land Economics Research**. University of Nebraska Press. Lincoln.

Ciriacy-Wantrup, S.V. 1952. **Resource Conservation: Economics and Policies**. Berkeley, University of California Press.

Copes, Percival. 1981. "Rational Resource Management and Institutional Constraints: The Case of the Fishery." in J.A. Butlin, ed., **The Economics of Environmental and Natural Resources Policy**. Westview Press.

Council for Agricultural Science and Technology. 1974. "Livestock Grazing on Federal Lands in the Eleven Western States." *Journal of Range Management* Vol.27 No.3.

Cramer, Gail L. and Jensen, Clarence W. 1979. **Agricultural Economics and Agribusiness**. 2nd ed., John Wiley and Sons, New York.

Dewey, John. 1966. **Logic: The Theory of Inquiry**. Holt Rinehart and Winston Pub.

Gardner, D. 1963. "A Proposal to Reduce Misallocation of Livestock Grazing Permits." *Journal of Farm Economics*, Vol. 45, No.1. 107-120.

Gardner, B. Delworth. 1983. "Market versus Political Allocations of Natural Resources in the 1980s". *Western Journal of Agricultural Economics*, Vol.8 No.2 215-229.

Gardner, B. Delworth. 1983. "The Role of Economic Analysis in Public Range Management."

Giannini Foundation Research Paper no. 626. Department of Agricultural Economics, University of California, Davis.

Hildreth, R.J. and Castle, E.N. 1966. "Identification of Problems." in **Methods for Land Economics Research.** University of Nebraska Press, Lincoln.

Joyce, T.F. 1969. "Policy and Administration of Public Lands in Alberta with Particular Reference to Agriculture." *Canadian Farm Economics,* Vol. 4, No. 1, 28-32.

Johnson, Glen L. 1978. "Opportunities for Systems Scientists in Modeling Agricultural Systems." in **System Theory Application to Agricultural Modeling.** USDA Washington, D.C..

Knetsch, Jack L. 1980. "Property Rights, Land Use Conflicts and Compensation." *Natural Resources Journal.* Vol. XXVII. p.20-30.

Krutilla, Fisher, Hyde and Smith. 1983. "Public vs. Private Ownership: The Federal Lands Case." *Journal of Policy Analysis and Management,* Vol. 2, No. 4 548-558.

Macenko, S.L. and Nrimanis, V.P. 1983. **An Overview of Crown Land Management in Canada.** Working Paper No.27, Lands Policy and Research Branch, Lands Directorate, Environment Canada.

Martin, William E. and Jefferies, Gene L. 1966 "Relating Ranch Prices and Grazing Permit Values to Ranch Productivity." *Journal of Farm Economics,* Vol. 48, No.2 233-242.

Miller, Ron J. 1972. **Alberta's Public Grazing Lands Rental System.** Alberta Department of

Lands and Forests, and Resource Economics Branch.

Monney, B. 1983. "An Evaluation of Farm Management Strategies Under Drought Conditions: The Case of Dryland Grain Production On The Canadian Praries." Ph.D. Thesis, Department of Rural Economy, University of Alberta.

Munro, Gordon R. 1981. "The Economics of Fishing: An Introduction." in J.A. Butlin, ed. **The Economics of Environmental and Natural Resources Policy**. Westview Press.

Northrup, F.S.C. 1947. **The Logic of the Sciences and the Humanities**. The World Publishing Company.

Olson, Carl E. and Jackson, John W. 1975. "The Impact of Change in Federal Grazing Policies on Southcentral Wyoming Mountain Valley Cattle Ranches." *Research Journal*, 96.

Pearce, P.H. 1969. "Principals for Allocating Wildland Among Alternative Uses."*Canadian Journal of Agricultural Economics* , Vol 17, No.1 , 121-131.

Richardson, James W., Lemieux, Catherine M., and Nixon, Clair J. 1983. "Entry into Farming: The Effects of Leasing and Leverage on Farm Survival." *Southern Journal of Agricultural Economics*, Vol.15 No.2 139-145.

Roberts, N.K. "Economic Foundations for Grazing Use Fees on Public Lands." *Journal of Farm Economics*,. Vol. 45 pp.721-731.

Salter, Leonard A. Jr. 1948. **A Critical Review of Research in Land Economics**. University of Wisconsin Press, Madison.

Scott, Anthony. 1983. "Property Rights and Property Wrongs." *Canadian Journal of Economics*. Vol. XVI. No. 4. p.557-569.

Sonntag, B.H. and Klein, K.K.1977. **A Bio-Economic Model of Beef, Forage and Grain Production for Western Canada**. Economics Branch, Agriculture Canada. Lethbridge, Alberta, Canada. Unpublished working paper.

Sonntag, B.H. and Klein, K.K. 1979. **A Beef Forage Grain Production Model for Farms in Western Canada**. Policy Planning and Economics Branch, Agriculture Canada. Minister of Supply and Services.

Sorboe, M. 1974. "An Economic Analysis of Grain-Beef Cattle Farms in the Lloydminster-Battleford Area of Saskatchewan." *Canadian Farm Economics*. Vol.11. No. 2.

Thompson, Peggy. 1981. **The Agricultural Land Base In Alberta**. Environment Council of Alberta, ECA81-17/IB3.

Thompson, R. 1982. "The Impact of High Voltage Electric Transmission Lines on Agricultural Land Values in Alberta." M.Sc. Thesis, Department of Rural Economy, The University of Alberta.

Toma, D. 1979. "Alberta Grazing Associations: A Study of Public Resource Utilization." M.Sc. Thesis, Department of Rural Economy, The University of Alberta.

Weins, J. 1974. "Economics of Forage Production and Use on Grain-Cattle Farms." *Canadian*

*Farm Economics*. Vol. 9. No. 4.

Winter, John R. and Whittaker, James K. 1981. " The Relationship Between Private Ranchland Prices and Public-Land Grazing Permits." *Land Economics*, Vol. 57 No. 3 pp.414-421.

Woloshyn, P.A. 1982. **Agricultural Real Estate Values in Alberta 1982**. Alberta Agriculture Resource Economics Branch.

Wood, V.A. 1976. **An Assessment of Rentals and Dues on Public Grazing Lands.** Alberta Energy and Natural Resources.

Wood, V.A. 1976. **An Assessment of Public Grazing Lands Used Under a Grazing Lease Granted to a Grazing Association or as a Grazing Reserve**. Alberta Land Use Forum, 1976.

# IX. Appendix A

# ALBERTA FARM BUSINESS FORM

NAME OF OPERATOR _____ ACRES OWNED _____

MAILING ADDRESS _____ ACRES LEASED _____

LAND LOCATION (HOME QUARTER) _____ TYPE OF LEASE AGREEMENT _____

OTHER LAND _____

| OPERATING EXPENSES FOR THE YEAR | | | | |
|---|---|---|---|---|
| Car Operating Expenses (1) Fuel (Farm Share) | | Crops | Crop Insurance and Fees | |
| (2) Rep. & Other (Farm Share) | | | Crop Sprays | |
| Truck Op. Expenses (1) Fuel | | | Fertilizer | |
| (2) Rep. & Other | | | Custom Work on Crops | |
| Tractor Op. Expenses (1) Fuel | | | Other Direct Crop Exp. | |
| (2) Rep. & Other | | Cow-Calf | Mill Feeds & Mineral | |
| Cultivation Equipment Repairs | | | Vet. & Med. | |
| Haying Equipment Repairs | | | Other Direct Cow-Calf Expenses | |
| Harvesting Equipment, Repairs & Fuel | | Beef Feeder | Mill Feeds & Mineral | |
| Livestock Equipment Repairs | | | Vet. & Med. | |
| Tools, Hardware & Other Repairs | | | Other Direct Beef Feeder Expenses | |
| | | Hogs | Mill Feeds & Mineral | |
| Farm Building Repairs (1) Crop Bldgs. | | | Vet. & Med. | |
| (2) Livestock Bldgs. | | | Other Direct Hog Expenses | |
| Fence Repairs | | | | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Telephone (Farm Share) | | | | | | | | | | | | | | | | | |
| Electricity (Farm Share) | | | | | | | | | | | | | | | | | |
| Miscellaneous (legal, accounting fees, etc.) | | | | | | | | | | | | | | | | | |
| Farm Rental Shares (1) Crops | | | | | | | | | | | | | | | | | |
| (2) Livestock (L.L. Gross L.S. Ret.) | | | | | | | | | | | | | | | | | |
| Farm Cash Rent (for enterprise) | | | | | | | | | | | | | | | | | |
| Land and Water Taxes | | | | | | | | | | | | | | | | | |
| Building Insurance | | | | | | | | | | | | | | | | | |
| Hired Labor | Total Months | Distribution J | F | M | A | M | J | J | A | S | O | N | D | Cash Cost | Cost of Board |
| Married | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| Single | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| Casual | | | | | | | | | | | | | | | | | |
| Total | | | | | | | | | | | | | | | | | |
| Cash Operating Expenses for the Year | | | | | | | | | | | | | | | | | |

## LIVESTOCK BLOCK

| | TYPE OF LIVESTOCK | P.M.W.U. | A.U. | Beginning of Year Inventory No. | | Born During Year No. | Bought Or Received In Trade No. | | Losses No. | House Use No. | | Sold Or Traded Off No. | | End of Year Inventory No. | | Labor Used on Livestock Spring | Summer | Fall | Winter |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COW-CALF ENTERPRISE | Herd Bulls | | | | | | | | | | | | | | | hrs./day | hrs./day | hrs./day | hrs./day |
| | Beef Cows | | | | | | | | | | | | | | | | | | |
| | Mature Heifers | | | | | | | | | | | | | | | | | | |
| | Heifer Calves | | | | | | | | | | | | | | | | | | |
| | Bull and Steer Calves | | | | | | | | | | | | | | | | | | |
| | Milk and Cream | | | | | | | | | | | | | | | | | | |
| | Total Cow-Calf Operation | | | | | | | | | | | | | | | | | | |
| FEEDER ENTERPRISE | Feeder Calves | | | | | | | | | | | | | | | hrs./day | hrs./day | hrs./day | hrs./day |
| | | | | | | | | | | | | | | | | | | | |
| | Feeders over 1 yr. | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | Total Feeders | | | | | | | | | | | | | | | | | | |
| HOG ENTERPRISE | Herd Boars | | | | | | | | | | | | | | | hrs./day | hrs./day | hrs./day | hrs./day |
| | Brood Sows | | | | | | | | | | | | | | | | | | |
| | Breeding Gilts | | | | | | | | | | | | | | | | | | |
| | Suckling Pigs | | | | | | | | | | | | | | | | | | |
| | Weaners | | | | | | | | | | | | | | | | | | |
| | Feeders up to 150 lbs. | | | | | | | | | | | | | | | | | | |
| | Feeders over 150 lbs. | | | | | | | | | | | | | | | | | | |
| | Total Hogs | | | | | | | | | | | | | | | | | | |

No. of Cows Wintered _____ cows
Average Weaning Wt _____ lbs./calf
Total Hrs. Labor _____ hrs.
Months of Labor _____ mos.
Amt Grain Fed _____ cwt.
Amt Supplement Fed _____ cwt.
Amt Roughage Fed _____ tons

Total Wt of Feeders End Year _____ lbs.
Total Wt Sold _____ lbs.
Total Wt Used in House _____ lbs.
Total Wt Purchased _____ lbs.
Total Wt at Start Year _____ lbs.
Total Wt of Beef Produced _____ cwt.

Total Wt Mkt Hogs End Year _____ lbs.
Total Wt Mkt Hogs Sold _____ lbs.
Total Wt Used in Home _____ lbs.
Total Wt Purchased _____ lbs.
Total Wt at Start Year _____ lbs.
Total Wt Pork Produced _____ cwt.

Aver No Sows kept _____ Sows
No litters _____ litters

## CROPS BLOCK

| LAND USE | Grade This Year's Crop | Yield Per Acre | Lease Land | Yields | Fertilizer | | Acres | Total Yield | | On Hand Beginning Year (Excl. Landlord's) | | Bought or Received in Trade | | Total Quantity Available | Sold Or Traded Off (Excl. Landlord's) | | Landlord's Share This Year's Crop | | QUANTITY USED FOR: | | | | | | | On Hand End Of Year (Excl. Landlord's) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Kind | Lbs. Per Acre | | Amount | | Amount | | Amount | | | Amount | | Amount | | Used For Seed | Dairy Cattle | Beef Cow - Calf | Bought Feeder Cattle | Hogs | Sheep | Poultry | Amount | Value |
| Wheat | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Wheat | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Oats | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rape | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Barley | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Barley | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Flax | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Forage Seed | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rye | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Other | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Other | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Other | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Other | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Silage | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Green Feed | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alfalfa Hay | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Clover Hay | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mixed Hay | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Grass Hay | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tame Pasture | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Straw | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total Cropped Acres | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fallow | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total Cultivated Acres | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| New Breaking | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Wild Pasture | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Waste Land | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Farmstead | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Other | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Other | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Other | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TOTAL FARM ACRES | | | | | | | | | | | | | | | | | | | | | | | | | | | |

## FARM OPERATOR'S CAPITAL INVESTMENT

| Property | Beginning Year Value | Capital Purchases and Improvements (Including Labor) | Sales | Depreciation | | End Of Year Value |
|---|---|---|---|---|---|---|
| | | | | Estimated Rate % | Amount | |
| Other House(s) | | | | | | |
| Garages | | | | | | |
| Cattle Buildings and Pens | | | | | | |
| Hog Buildings and Pens | | | | | | |
| Sheep Buildings | | | | | | |
| Poultry Buildings | | | | | | |
| Machine Sheds and Shops | | | | | | |
| Granaries and Bins | | | | | | |
| | | | | | | |
| Total Farm Buildings | | | | | | |
| Improved Land ____ ac. | | | | | | |
| Raw Land ____ ac. | | | | | | |
| Operator's Total Land | | | | | | |
| Operator's Total Real Estate | | | | | | |
| Cars No. ____ | | | | | | |
| Trucks No. ____ | | | | | | |
| Tractors | | | | | | |
| Cultivation Equipment | | | | | | |
| Haying Equipment | | | | | | |
| Harvesting Equipment | | | | | | |
| Livestock Equipment | | | | | | |
| Tools, Welders and Other | | | | | | |
| | | | | | | |
| Operator's Total Equipment | | | | | | |
| Operator's Livestock | | | | | | |
| Operator's Grain and Hay | | | | | | |
| Unused Fertilizer and Supplies | | | | | | |
| Operator's Total Farm Investment | | | | | | |
| Rented Real Estate | | | | | | |
| Landlord's Equipment | | | | | | |
| Landlord's Livestock | | | | | | |
| Total Farm Investment | | | | | | |
| Operator's House | | | | | | |

## ADDITIONAL COSTS AND CONCERNS SPECIFIC TO LEASE

RENT _____

TAXES _____

WATER DEVELOPMENT _____

WATER MAINTENANCE _____

FENCE DEVELOPMENT _____

FENCE MAINTENANCE _____

CLEARING _____

BREAKING _____

SEEDING _____

SOIL QUALITY _____

SALINITY OF SOIL _____

RELATIVE LAND QUALITY(Ac./AU) _____

BRUSH ENCROACHMENT _____

PRODUCTIVITY OF CATTLE _____

DISTANCE TO LEASE _____

CONTROL OF PUBLIC ACCESS _____

SECURITY OF TENURE _____

FLEXIBILITY OF LEASE USE _____